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ABSTRACT

A maternal death is defined as the death of a woman while she is pregnant or within 42 days of the end of her pregnancy from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. No one knows exactly how many women die from bearing children because data is imprecise in most countries. However, it is clear that the situation can be improved. This issue of Children in the Tropics provides information to that end. Focusing on childbearing and women's health, the issue offers an overview of maternal mortality from a global perspective, a discussion of the role of the International Children's Center in reducing maternal mortality, causes of maternal mortality, programs for training traditional birth attendants, the antenatal consultation, maternity units at referral centers, and planned parenthood. Five appendices provide information on: (1) infection, asepsis, and hospitalism; (2) AIDS; (3) the process of dating the beginning of pregnancy; (4) physiology of the female sexual cycle; and (5) protocols for anesthesia-resuscitation and the Republic of Burundi's antenatal consultation card. (RH)

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CHILDREN IN THE TROPICS

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CHILDBEARING AND
WOMEN'S HEALTH

1990 - N° 187/188

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INTERNATIONAL CHILDREN'S CENTRE - PARIS

The International Children's Centre was created by the French government in 1949, on the initiative of Professor Robert Debré in particular, following negotiations between France and the United Nations. Its purpose was to furnish those international and national agencies dealing specifically with child care with training facilities and educational and informational tools in the field of child health and development, viewing children within their family and surroundings.

ICC soon turned essentially toward Third World children and devoted its activities to the training and education of personnel with social, educational and administrative responsibilities as well as medical and paramedical workers. The desire for greater efficiency has led it to work increasingly with trainers and to concentrate its efforts on the methodological and educational aspects of mother and child care programmes.

JCC is also engaged in an attempt to further study — and — action on some aspects of the life and health of children and their family, so as to contribute to practical improvement, particularly in the fields of growth, nutrition, planned parenthood, the control of transmissible and nutritional diseases, preschool and school education, the needs of disabled and underprivileged children, etc.

Over this period of more than 30 years, a large amount of documents on children and adolescents, mostly from the developing countries, has been accumulated. This international documentation has been classified and sorted out, and has been computerized since 1983 : a bibliographic data base (BIRD : « Base d'Informations Robert Debré ») may be consulted anywhere in the world, through international communications networks. ICC also publishes periodicals, educational documents and specialized bibliographic bulletins.

As for its legal status, the International Children's Centre is a foundation under french law of recognized public utility, administered by an executive board with broad international membership.

CHILDREN IN THE TROPICS

REVIEW OF THE INTERNATIONAL CHILDREN'S CENTRE

1 CHILDBEARING AND WOMEN'S HEALTH

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1990 - N° 187/188

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Dr. LUC D'ESTANNE DE BERNIS wishes to dedicate this paper to his dear friend, the late Dr. DANKAR NEKIAMBE, as well as to the staff of the N'DJAMENA and SAHR (Chad) maternity hospitals.

He wishes to thank MARIE-NOELLE GARCON, nurse-anaesthetist at the N'DJAMENA maternity hospital.

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by M.H. Bouvier-Colle

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MATERNAL MORTALITY

A definition...

A maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (1).

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(1) *International Classification of Diseases, Ninth Revision. WHO. ICD. 9.*

MATERNAL MORTALITY : A GLIMPSE AT THE GLOBAL SITUATION

by M.H. BOUVIER-COLLE

"I'm going to the ocean, to bring back a new baby, but the trip is long and dangerous, and there is a possibility that I may not return". According to the local folklore, this is what a Tanzanian mother tells her children when she senses that the time for childbirth is near. This phrase immediately introduces us to the immensity of the problem represented by maternal mortality, even at the present time. The World Health Organization (WHO) has estimated that at least one half million women die each year, around the world, as a result of pregnancy, abortion or puerperal problems. According to these estimations, over 60 % of maternal deaths occur in Asia, especially in South-east Asia, 30 % in Africa and 7 % in Latin America. Only 6,000 such deaths are recorded in the developed countries.

Although these figures do provide some indications, it is a fact that knowledge of the worldwide magnitude of the problem is still insufficient, and no-one really knows exactly how many women die in bearing children. There is no definitive information available on the problem, because there is no routine notification of deaths and of their cause in those countries where this mortality is probably highest.

However, there are an increasing number of studies limited to a single hospital or health sector, or representative of a country. These do provide some indications, and three main facts may be noted :

- maternal mortality is still a little-explored problem, since data is quite incomplete in many parts of the world ;
- there are enormous disparities between the continents, and also within a given country ;
- two factors stand out with respect to influence on the magnitude of maternal mortality : the fertility rate and access to health services.

A POORLY EVALUATED PROBLEM

The extent of the problem of maternal mortality is still poorly evaluated, since data is imprecise in most countries. It has been defined by the Fédération Internationale de Gynécologie Obstétrique (FIGO) and WHO as the death of a woman, occurring during pregnancy, regardless of the outcome (that is, including spontaneous miscarriage and therapeutic or induced abortion), or within 42 days of its termination.

International estimations

The estimations published by WHO on a regional basis (table 1) show that the Indian subcontinent has the highest gross figures for maternal mortality (230,000 deaths per annum). This corresponds to the high population density : in India, there are more

deaths in a single week than in an entire year in Europe. The next highest figures are in South-east Asia (52,000) and West Africa (54,000).

Table 1

ESTIMATED ANNUAL NUMBER OF MATERNAL DEATHS IN
DIFFERENT PARTS OF THE WORLD, TOWARD 1980.

Regions	Numbers	
West Africa	54 000	
East Africa	46 000	
North Africa	24 000	Total AFRICA :
Central Africa	18 000	150 000
South Africa	8 000	
Southern Asia	230 000	
South-east Asia	52 000	Total ASIA :
Western Asia	14 000	308 000
Eastern Asia	12 000	
Sub-tropical America	22 000	Total LATIN AMERICA :
Central America	9 000	34 000
Caribbean	2 000	
Temperate South America	1 000	
Oceania	2 000	
Developped countries	6 000	
WORLD TOTAL		500 000

Source : WHO

When compared with the corresponding figures for live births, these figures give some indication of the frequency of occurrence of maternal death in each of these regions. It is probably in West Africa and Central Africa that the rate of maternal mortality is highest : each year, for 100,000 newborn babies, an average of 700 mothers disappear. Everywhere else in Africa, as well as in Central Asia, the rates apparently exceed 500 deaths for 100,000 births. Latin America is in an intermediate situation, with rates somewhere around 250 to 300 for 100,000. At the opposite pole, in the industrialized countries, in northern and western Europe and on the North American continent, these rates are frequently below 10.

These figures show the general magnitude of the problem in different places, but do not provide an accurate measure of the phenomenon, since two thirds of the world's population live in countries where neither births nor women's deaths, on which these births are dependent, are routinely recorded.

Hospital studies

Data-collection within establishments practicing deliveries may make up for the absence of vital statistics : the number of live births occurring in the maternity unit during a certain period as

well as the maternal deaths occurring during the same period and in the same maternity unit are counted. However, such calculations are biased, because the population attending these facilities is not a representative one: women at greatest risk are referred to the hospital before delivery, and women in danger arrive there as emergency cases, and this results in an artificial increase in figures for the frequency of maternal mortality. Sometimes only women with sufficient financial resources may attend these maternity hospitals, and this then artificially lowers the mortality figures.

Population surveys

Several survey methods applied directly to the population at large also provide an approach to maternal mortality, since the family, husband or sister are questioned by interviewers, specialized or not, with or without the help of traditional midwives; the rules governing the implementation of these surveys must systematically be adjusted to the sociocultural context in which they are applied. Last, indirect estimation methods have been developed by demographers in different countries.

Vital statistics

In those countries in which maternal mortality may be measured on the basis of vital statistics, frequency is usually underestimated. A study done in one region of France, which compared known maternal deaths in hospitals with deaths recorded in the statistics for medical causes of deaths, has shown that in this region maternal mortality as measured by routinely collected data was underestimated by half, and the present author's recent research at the national level, on a representative sample of deaths of women of childbearing age definitely seems to corroborate this finding. In the United States, the percentage of maternal deaths unidentified by the routine coding found on death certificates ranges from 27 % in Georgia to 73 % in Puerto Rico. This is partially explained by the methods governing the notification of deaths, and partially by the occasionally erroneous application of rules for the classification of deaths. Actually, in both of these countries systems for spontaneous, direct case notification by physicians are currently being experimented. England, Wales and some states in the USA have a more than three decades-long history of conducting confidential investigations of each maternal death, for which notification is compulsory. Only such investigations yield a proper understanding of the reasons for the death and of whether it might have been avoided, and consequently make it possible to visualize measures for improving the situation.

To summarize, regardless of the demographic and economic situation of each country, maternal mortality remains a little-known problem everywhere. It is clear, however, that its incidence is in no way comparable in the industrialized countries and in developing countries.

**AN
UNACCEPTABLY
HEAVY
INCIDENCE ON
FEMALE
MORTALITY**

Maternal mortality weighs heavily and unacceptably on female mortality in most countries, where one fourth to one third of women's deaths are maternity-related.

High maternal mortality is linked with high overall mortality within the population considered. For instance, when rates of maternal mortality are compared with life expectancy at birth and with infantile mortality (table 2), maternal mortality is seen to rise when the general life expectancy is low. This is hardly surprising, since nearly one third of deaths among third world women are connected with pregnancy.

Table 2
COMPARISON OF DEMOGRAPHIC DATA
AND MATERNAL MORTALITY IN AFRICA (1)

Regions	Gross mortality rate ⁽²⁾	Life expectancy ⁽³⁾	Infantile mortality ⁽⁴⁾	Maternal mortality ⁽⁵⁾
North Africa	11,2	58,4	93	500
South Africa	12,9	55	88	570
East Africa	15,5	50,9	100	660
Central Africa	16,4	49,5	110	690
West Africa	17	48,9	113	700

(1) Sources : SALA DIAKANDA and WHO

(2) overall mortality per 1,000 inhabitants

(3) life expectancy at birth, in years

(4) per 1,000 live births

(5) per 100,000 live births

The frequencies are so variable from one continent to another and from one country to another that it almost seems vain to make comparisons. Any comparison between the rate observed in Andhra Pradesh and the figures found in Hong Kong (150 times lower) would be hazardous, for instance, since these two populations which live on the same continent are at completely different levels of economic development. However, it does seem that the contrasts are greatest when mortality rates tend to be highest. In Africa, where the continental average is estimated at 640 per 100,000, rates frequently exceed 1,000 in rural areas or in certain hospital centres that attract the most desperate cases. In Nigeria, the figures are somewhat puzzling, since the rate may range from 180 to 1,300, depending on the hospital. Similarly, the rate is apparently 33 times higher in Mali than in Zimbabwe. In South America, where the average figures for the continent are lower, Bolivia is nonetheless seen to have a rate nearly 30 times as high as its neighbour, Peru. And within Peru itself, one study indicates the existence of astonishing regional differences : a rate of 5.5 on the coast, in contrast to 90.3 in the tropical forest area.

Such disparities are stunning, and there is no equivalent for other causes of death in comparable contexts. And yet, the causes of maternal mortality are well known.

The main direct, universal causes of this mortality are haemorrhaging before and after delivery, ruptures of the uterus, puerperal infections and conditions connected with gravidic hypertension. These are the very same causes which were successfully combated years ago in the industrialized countries. The factors directly responsible for most of these conditions are well known : numerous pregnancies, undesired pregnancies, lack of supervision during pregnancy and absence of proper medical and surgical treatment when needed. The two main contributive factors to be considered, then, are : uncontrolled fertility and lack of appropriate medical care. It is possible to deal with these problems.

WHAT SOLUTIONS ?

Controlling fertility

The considerable contrasts observed around the world indicate that the means of successfully combating this fate do exist, through action affecting two factors : fertility and appropriate care.

There are several aspects to uncontrolled fertility. The most dramatic one involves pregnancies that are not desired by the woman, since in a great many countries these often result in abortion under pitiful conditions. In South America where abortion is illegal and therefore underevaluated by official statistics, estimations based on surveys show the following : over half of maternal deaths in Santiago de Chile and half of those recorded in Brazil are apparently caused by abortions. Elsewhere, in Ethiopia for instance, one death out of three is attributed to an abortion, while this proportion is one death out of four in Bangladesh.

Conversely, according to a worldwide survey of fertility, if every woman who claimed not to want any more children had been able to avoid any further pregnancies, the number of births would have been reduced by 35 % in Latin America, by 33 % in Asia and by 17 % in Africa. The number of maternal deaths would have been reduced in the same proportions, and perhaps even more so, given the high mortality rate linked with induced abortion.

The second consequence of uncontrolled fertility is the multiplication of risks of death for a woman, in the course of her existence. It is well known that pathological risks increase with age and parity. In addition to the risk involved in each pregnancy, the total risk run by a woman in the course of her life must be taken into consideration. This risk depends on the number of pregnancies she has experienced, and on the rate of maternal mortality in her country. The health of a woman with a large family (ten children) is not threatened in the same way in a country in which maternal mortality is very low as it would be if she had the same number of children in a country where the medical situation is precarious.

The total lifetime risk has been calculated for each of the world's major health regions (table 3). In northern European countries, women having less than two children on the average and receiving proper medical coverage runs a minute risk of dying for pre-

gnancy-related reasons : 1 out of 9,850. In some parts of the world this risk is enormous, on the other hand, since it is as high as 1 out of 20.

Table 3
REGIONAL ANALYSIS OF WOMEN'S RISK OF MATERNAL
DEATH AS A FRACTION OF TOTAL LIFETIME, 1974-1984

Regions	Maternal mortality	Fertility rate	Risk of maternal death as fraction of total lifetime
West Africa	700	6.4	1/19
Central Africa	690	6.1	1/20
East Africa	660	6.8	1/19
South Africa	570	5.2	1/29
North Africa	500	6.0	1/28
Central Asia	650	4.9	1/26
Western Asia	420	5.8	1/34
South-east Asia	420	4.5	1/44
Far East	55	2.1	1/722
Sub-tropical America	310	4.1	1/66
Temperate South America	110	3.1	1/244
Central America	240	4.8	1/72
Caribbean	220	2.7	1/140
United States, Canada	7.7	1.7	1/6366
Eastern Europe	44	2.0	1/947
Mediterranean Europe	19	1.8	1/2437
Western Europe	15	1.7	1/3268
Northern Europe	4.7	1.8	1/9850
Papua-new Guinea	728	5.5	1/21
Australia - New Zealand	9.1	1.9	1/4805

Source : HERZ, World Bank

Appropriate care

A simple glance at a map of the world representing the proportion of births attended by trained workers clearly shows the parallel between the level of maternal mortality and the existence of proper care (figures 1 and 2).

In a country as highly developed as the United States, the level of mortality recorded in a group refusing all medical care for religious reasons was compared with the rest of the population of the state of Indiana. The maternal mortality rate was 90 times higher in those women who received no medical care.

Precise studies have demonstrated that a planned health intervention, which may be quite simple, immediately results in a drop in maternal mortality. In Addis Abeba, for instance, it has been shown that the relative risk of maternal mortality is twice as high in women receiving no care as in the others, even when the latter group includes women who only attended a single antenatal consultation. Another example is the action conducted in Zimbabwe on decision-making pertaining to caesarean sections, which reduced the number of unjustified caesarean sections and consequently the number of maternal deaths.

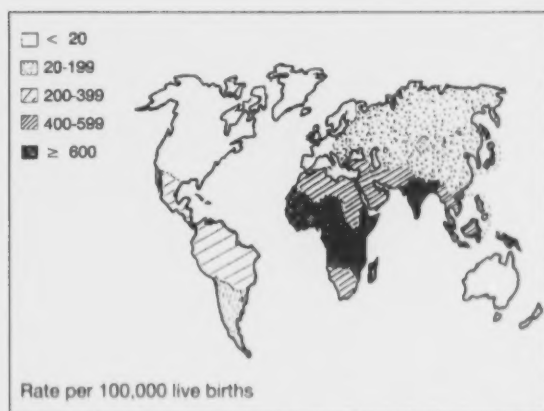


Figure 1 - Map of estimated frequency of maternal mortality in different parts of the world, toward 1980.
Source : WHO

Last, when studying deaths in their maternity unit, many authors have arrived at the conclusion that a non-negligible proportion of these were avoidable. This proportion has been evaluated at 85 % in the Donka University Hospital in Guinea, and although it is probably lower elsewhere, there is no doubt that a great many maternal deaths could be avoided.

This is not the appropriate context for developing examples of what could be done to improve the situation, but it is important to mention them, in order to show that the great differences in levels of mortality are no doubt the result of extremely different and contrasting practices in various parts of the world.

In conclusion, the following points should be emphasized. Maternal mortality remains the main health problem among women for three-fourths of the world's population. Historical studies of maternal mortality have shown that extremely specific drops in the latter have been achieved by the introduction of well-defined techniques (lower segment caesarean section in Sweden, use of antibiotics, delivery in maternity hospitals). Many deaths might be avoided by limiting the number of undesired pregnancies. Those methods which proved effective in countries with equally high maternal mortality rates some decades ago should again be effective for today's problems.

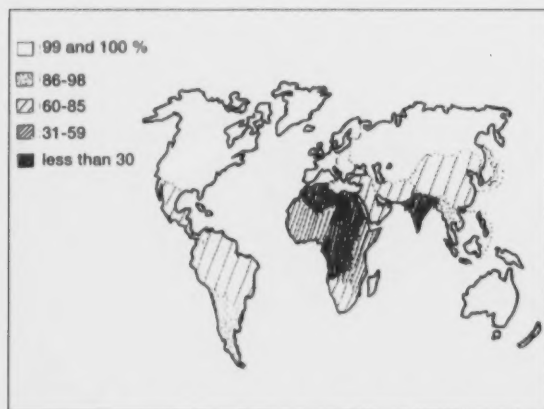


Figure 2 - Map of the proportion of births benefitting from qualified aid (%).

REDUCING MATERNAL MORTALITY : A RECENTLY IDENTIFIED PRIORITY

by S. DORMONT

THE ROLE OF THE INTERNATIONAL CHILDREN'S CENTRE

*The International
Children's Centre*

500,000 maternal deaths each year. This is the figure given by WHO in 1985 (1).

The same figure - 500,000 - is still in circulation, and often repeated despite the considerable epidemiological efforts deployed at the international level. The extent of the problem has only come to public attention relatively recently. It is striking to note that the maternal mortality rate is not one of the 12 indicators defined by WHO in its "health for all by the year 2000" programme (Geneva, 1981), although the latter is greatly concerned with maternal health.

It was only in November 1985 that an interregional meeting on the prevention of maternal mortality was organized by WHO, in Geneva.

In February 1987, three major international agencies, the World Bank, the World Health Organization and the United Nations Fund for Population Activity, participated jointly in an International Conference on Safe Motherhood, held in Nairobi (Kenya). This conference resulted in a call for action and for the establishment of a joint fund run by WHO in Geneva, to finance the implementation of operational research.

Owing to the insufficient participation of the French-speaking nations of Africa in the Nairobi conference, the World Bank organized a regional conference for French-speaking subSaharan African countries in Niamey on 30 January to 3 February 1989, with the participation of a number of organizations, including the International Children's Centre.

This latter has a long history of concern with maternal health, as is most clearly shown by issues of "Children in the Tropics : n° 105 (1976), devoted to "The Management of Pregnancy", n° 152/153 (1984) on "Prevention in Obstetrics", as well as n° 159 (1985) "Women's lives, mothers' health", in which the problem of maternal mortality is discussed at length. It was in 1988, however, that a programme extending over several years was developed and gradually implemented. It includes several facets :

- a seminar for French-speaking African countries, held in October 1988 at the Château de Longchamp in Paris, the conclusions of which were endorsed at the Niamey conference ;

- workshops in research methodology, organized with the participation of WHO (Cotonou, 1989 ; Ouagadougou, 1990) ;

1) WHO Chronicle. 1986, 40, n° 5, pp. 193-202.

- participation in setting up operational research in certain countries.

This programme shows the ICC's desire to intensify its collaboration with a number of countries, for the implementation of methodological support and operational research.

The death of a woman during a pregnancy or delivery is usually the outcome of a long chain of circumstances, the origins of which date back to her own childhood. These are indicative of women's situation in many developing countries : less well nourished during childhood, attending school less often, burdened with housekeeping and often with farm work.

The tragic nature of this "long road to death" has been remarkably illustrated by Mr FATHALLA, present head of WHO's special programme for research, development and training for research on human reproduction, in a video tape as well as in an article published in the periodical "Peoples" (1). Fatima, aged 39, who had already mothered 7 children 5 of whom were still alive, died of bleeding caused by placenta praevia, after having been admitted too late to a hospital at which only one-half litre of blood was available. She lived in a rural area, under relatively poor socioeconomic conditions, was illiterate and had never had access to a planned parenthood service nor to an antenatal consultation.

Irrespective of the direct cause of death (haemorrhage, dystocia, infection, toxæmia or other), there are almost always other, indirect causes (poor nutritional status, anaemia, late age with or without grand-multiparity or conversely, adolescents at the very beginning of fertility), as well as institutional factors (lack of access to correctly equipped hospital facilities, lack of primary health care services capable of providing the indispensable antenatal consultations as well as counselling on birth control). The sociocultural environment plays an essential role, since local customs may be in contradiction with access to care, while women too often do not have a clear perception of their utility.

Nor should the contribution of illegal abortions be overlooked : the exact figures are difficult to determine, since such deaths are usually not reported, but according to some estimations they may account for 25 % of maternal deaths.

Only by acting at all levels can the present combat be effective. A recent study has shown that an adequate organization of primary health care may bring the maternal mortality rate down from 500 to 350 per 100,000. If this figure is to be brought down to 65 per 100,000, however, this can only be done by making access to a health centre capable of treating severe complications by caesarean section, uterine inspection and/or curettage, blood transfusion, antibiotics or any other necessary operation available to all women whose condition requires it.

(1) *La longue route de la mort*. In : *Peoples*, 1987, 14, pp 8-9.

The four cardinal elements in this combat were summarized by H. Mahler, then General Director of WHO at the Nairobi conference, in his introductory remarks :

Primary health care

- adequate primary health care, as well as universally accessible birth control methods ;

Antenatal care

- satisfactory antenatal care, starting from the onset of pregnancy, and including early, effective screening of high risk cases and referral of the women involved to a more specialized unit ;

Attendance

- attendance of all deliveries by a trained worker ;

Access

- effective access to all major elements of obstetrical care for all high-risk women and for all those whose condition requires emergency action.

There is no need to stress the fact that this is an ambitious programme. At the national level, priorities must be defined, choices made and strategies developed in accordance with resources, which should be actively prospected. It is in this perspective that multidisciplinary teams should be set up and placed in charge of national or regional programmes for the control of maternal mortality and morbidity.

Workshops in research methodology

The ICC endeavours to contribute to the training required by such teams, by organizing workshops in research methodology for 6 countries in subSaharan Africa, in collaboration with WHO. The objective of these is to use examples chosen by the participants as a basis for discussing the various methodological approaches to research on maternal health, including :

- measurement or estimation of maternal mortality rates ;
- analysis of the causes of maternal mortality and morbidity, and especially of the avoidable causes, so as to improve maternal health care and to provide assistance in planned parenthood ;
- evaluation of health systems and of the socioeconomic circumstances surrounding maternal mortality and morbidity in a given context, with special emphasis on cultural factors ;
- estimation of unsatisfied needs with respect to maternal health and planned parenthood ;
- establishment of operational research schemes with proposals for intervention and evaluation.

At the end of these workshops, definite projects must be drawn up and sources of financing sought, especially through the "Safe Motherhood Initiative" fund, administered by WHO in Geneva.

Operational research

As for the ICC, it is presently participating in two operational research projects :

- one, in Cotonou, Benin, deals with the study of risk factors in perinatal mortality and morbidity and in maternal morbidity ;

- the other in Cameroon, in two areas, one rural and one semi-urban, located in proximity to Yaoundé, aims at defining a strategy for the reduction of maternal mortality and morbidity, using a risk-correlated approach. Following a prior large-scale study aimed at carefully defining the present situation with respect to pregnancy and delivery and their management, the programme's action is to be based on increasing the population's awareness and information, with the participation of women's organizations, as well on training health personnel at the different levels of health care delivery.

In both cases, sociological-anthropological studies will attempt to determine the population's perception of the health system, and those cultural barriers which may prevent use of available facilities. Similarly, these studies should provide information on the actual role of the health personnel, as well as on their perception of health care structures.

What use is there in sending at-risk women or emergency cases to referral units, if the centre in which they arrive is unable to provide the necessary care, owing to lack of facilities or of drugs, a situation that is often ascribable to an unmotivated, discouraged staff.

The task of contributing to the reduction of maternal mortality by one-half by the year 2000 - the objective set by the international agencies - is both difficult and complex. It requires political determination on the part of governments, but also the active contribution of many other participants. The ICC, for one, is ready to do its part, with the help of the international organizations, national agencies such as the Institut National de la Santé et de la Recherche Médicale (INSERM-France) and the French Ministry of Co-operation and Development.

CAUSES OF MATERNAL MORTALITY

by L. DESTANNE DE BERNIS

Louise A., age fifteen, married to a farmer, was pregnant for the first time. She had never attended an antenatal consultation. When admitted to the maternity, she was extremely pale, with disordered consciousness and fever. The child had a head presentation that was impacted in the middle region of the pelvis. Foetal heart sounds were absent. Louise died two hours after her admission.

Kaltouma T., age thirty five, had mothered six children, five of whom were still alive. This was her seventh pregnancy ; she received antenatal care, and the delivery took place at home : a girl weighing 3.550 kg. Kaltouma was sent to the hospital for postpartum haemorrhage. She died one-half hour after her arrival. No transfusion was available.

Indira G., age sixteen, was pregnant for the first time. Following an illicit abortion when she was about 3 months pregnant, she developed peritonitis and perforation of the uterus, was hospitalized and died 4 days later, despite a hysterectomy.

These are some ordinary entries on the rural and urban maternity records of every developing country.

Causes of death

It is important that the cause of death be determined. Here, Louise suffered from mechanical dystocia (1), Kaltouma had postpartum haemorrhage due to uterine atonicity (the uterus remains flaccid following delivery, does not contract and therefore bleeds) and Indira died of postabortal peritonitis (2).

Medicals

Is this sufficient for reflection on what must be done to avoid such situations ? Certainly not, since in fact, Louise did not die simply of mechanical dystocia, but of undiagnosed, untreated dystocia. It was because she had no competent attendant with her that she arrived at the maternity too late, when nothing could be done to save her.

This is important, because if Louise had given birth in a maternity, she could have benefitted from a caesarean section and her baby would have been born under satisfactory conditions. It is a fact that medical solutions do exist at present for most obstetrical problems. Louise really did die of mechanical dystocia, and probably of a ruptured uterus, but above all, she died because of the overall circumstances under which her pregnancy and delivery took

(1) Mechanical dystocia : the foetus (too large) cannot pass through the pelvis (too narrow). Mechanical dystocia, which depends on the pelvis, is distinguished from dynamic, or "motor" dystocia, in which the cause of the disorder is uterine contraction.

(2) Peritonitis : inflammation of the peritoneum. This is a frequent surgical emergency in cases of illicit abortion.

place. The same is true for Kaltouma and Indira. It is the context, then, which must be studied if solutions are to be found. A complete reformulation of the histories of Louise, Kaltouma and Indira is necessary.

Louise was fifteen years old and lived with her husband, a farmer, in a small village at a distance of 20 km from the nearest rural hospital, which has a few beds available for birthing, two nurse-midwives on its staff, and no operating room. Louise was married at age 14, and never attended school. This was her first pregnancy and she did not go to any antenatal consultation. When she felt the first contractions she followed the local custom, and went to her parents' home. A woman from the village came to assist her. The contractions came at regular intervals, and she broke her "waters" on the first day. On the second day she continued to have strong contractions and bled moderately. Louise was exhausted, and the matrone gave her an herb tea known only to her. On the eve of the second day, delivery was still not in sight, and Louise no longer felt her baby moving. After a long talk with her husband and her parents, it was decided that she should go to the hospital. A means of transportation was finally found, and several hours later she arrived at the hospital, unconscious. The nurse-midwife examined her and did not hear the foetal heart sounds. The uterus was closely moulded around the foetus, extremely contracted, with no distention. A digital vaginal examination showed a presenting head engaged in the middle area of the pelvis. The fluid flowing from the vulva was a mixture of blood and meconium. Her temperature was 39° C. Delivery was attempted by pressing on the fundus of the uterus, with no success. Since her blood pressure was very low (60/30) an infusion was set up, and her husband was told that she required transferral to the provincial hospital. Louise died before a means of transportation could be found.

Kaltouma's case was different. She was aged 35 and lived in a town possessing a clinic and a small rural hospital employing a nurse-midwife. This was her 7th pregnancy, she had already given birth to 6 children, 5 of whom were alive. Her husband was polygamous. She had no education, cared for her children and tilled a garden whose produce she sold at the market. This undesired pregnancy began while she was still nursing her last-born child, and it was very tiring. At the antenatal consultation, to which she went three times, she was advised to give birth at the hospital, because of her age and her numerous pregnancies. However, when the contractions began, she remained at home as she had always done, and sent for the traditional midwife who had helped her with her previous deliveries. Following 4 hours of satisfactory contractions she gave birth to a girl, and the placenta detached itself several minutes later. Kaltouma was exhausted. One-half hour later she began to bleed profusely; Kaltouma felt extremely weak and nauseated, her vision was blurred. She died upon her arrival at the maternity, only 800 metres away.

Indira lived in a large city. She was 16 and had attended school until age 12, at which time her mother asked her to take care of her brothers and sisters while she herself ran a store in order to provide for the family. Health or sexual matters had never been brought up at school. She never talked to her mother about such things. When she ceased to menstruate, she talked to an older girlfriend, who gave her the address of a woman in the city. The woman told her that she was pregnant, and performed a curettage, for a fee. While the woman was doing the scraping Indira experienced violent pain and probably fainted. She was still bleeding when she arrived home. The next day the pain did not subside and vomiting and shivering developed. On the third day her father noticed her condition, and took her to the hospital, where peritonitis was diagnosed. Surgery revealed a perforated uterus. A hysterectomy was performed. Four days after the operation, and despite the antibiotics purchased by her father, she died.

Here, then, is the true story of these three women, who died in silence in their home or in a maternity, like 500,000 others each year in developing countries around the world. An analysis of these three tragedies brings out the causes underlying maternal deaths, for there are always several causes :

- causes connected with women's status ;
- causes connected with under-development ;
- medical causes.

WOMEN'S STATUS

Educational level

Louise and Kaltouma were illiterate. Indira had left school at age 12. Girls are sent to school less often, and miss school more often than boys. All too frequently schools do not teach health education as they should. Indira did not receive any courses in health or any sex education. It is a long-known fact that infantile mortality rates are directly correlated with the extent of mothers' education. In other words, the children of illiterate mothers run a greater risk of dying during their first year of life than those with an educated mother. There is probably a link between women's educational level and their own death or survival.

Early marriage

Louise was married at age 14, and the same may be true of Kaltouma. Excessively early marriage is often the reason for pregnancies occurring during adolescence (before age 18). Furthermore, young girls are often less well fed than young boys.

Work

In addition to her work at home (housework, children), Kaltouma was obliged to tend to her family's financial needs through her trade. As a young girl, Indira had to take care of her brothers and sisters. Women work at a very early age, and generally a great many hours each day. Often the family economy rests on their shoulders.

Polygamy

Kaltouma shares her husband with other wives, since he is polygamous. Polygamy usually worsens women's status, since it puts many people under the same roof, creates rivalry, etc...

Inequality

Women's economic status is clearly inferior. Women do not possess the fields they till, nor the family's money, even when it is

they who earn it. Women are poorer than men, and widows are poorer still.

Men and women do not have equal rights with respect to divorce. A man can repudiate his wife, who then finds herself devoid of resources. This is the tragedy experienced by women who have suffered an obstetrical trauma such as a vesiculo-vaginal fistula, or who have become sterile as a result of endometritis. This obstetrical pathology affects between 5 and 10 million women around the world. Estimations show that for one mother who dies, ten to fifteen remain marked by severe sequelae after their delivery.

Law

Indira died of the aftermaths of an illicit abortion. The law prohibits abortion but does not provide women with the means of avoiding undesired pregnancies. It is now well known that women die of pregnancies that are not desired or that occur too early, too late or too close together. Laws prohibiting termination of pregnancy (induced abortion) do not eliminate abortion, they simply send them underground, thus considerably increasing the risk of death. This is true on every continent.

Tradition

The weight of tradition is universally important, and women can scarcely go against it. For example, Kaltouma attended antenatal consultations, and despite the advice she received there, she gave birth at home. In the case of Louise, her father insisted that she give birth at his house, and her husband had to be convinced of the need to transfer her to a hospital, after which the means of transportation had to be found.

Traditional practices may be causes of maternal mortality and morbidity. Sexual mutilations such as excision and infibulation are responsible for suffering, vesico-vaginal fistulas, birthing difficulties and death in millions of African women. "The Pharaonic operation consists of crudely cutting away all the extruding parts of the female genitalia, the Labia majora, the Labia minora, and the clitoris... The local native midwife is the operator, and the instrument usually employed is a razor, the blade of which has been bound with tape or string to within half an inch of the top. No sterilization is attempted ; the blade is merely wiped on a rag between each case... The girl is held down, her legs apart, by her female relatives who "lulu" shrilly during the operation to drown the agonized shrieks of the victim. No anaesthesia of any sort is used. After the operation a hollow straw is inserted at the top end of the wound, so that a small orifice will remain for the passage of urine and for the monthly flow. The edges of the wound are sometimes crudely sutured, with thorns held in place by a thread wound round the projecting ends in figure-of-eight fashion. A pad soaked in sesame oil is then applied and the girl's legs are strapped together and kept so for forty days... The dire results of the barbarian Pharaonic system, physical and psychological, are manifold. Bleeding and septic infection not infrequently follow the mutilations of butcher midwives, and septicaemia and death may intervene... Obstruction to the urinary flow may result. The opening may be so narrowed that sterility is inevitable unless a repair

UNDER-DEVELOPMENT

Inadequat communications

operation is undergone... If pregnancy does occur, labour is endangered and so is the child. The scarred tissue of the vulva has to be cut to allow the birth of the baby. It has to be stitched up afterwards, this sequence occurring with increasing shock at each subsequent parturition. Further, the monthly cycle may become a recurring nightmare (1)".

Poverty and illiteracy and their consequences for family hygiene, housing and diet, etc... also play a role.

Another negative factor is the lack of means of communication : few roads, vehicles, telephones or ways of sending messages. The nurse-midwife who attempted to deliver Louise was unable to transfer her to the maternity that was equipped to cope with an emergency of this type. The lack of newspapers and of books, the few radios and television sets, make it difficult to spread knowledge and education, and through these, progress in health. Louise, for instance, did not take advantage of the national health education campaigns broadcast on the radio. Lack of means of communication is a great handicap in the fight against maternal mortality.

Health education is dispensed by primary health agents, but only a small number of traditional birth attendants are trained, retrained and supervised. Male and female nurses, midwives and doctors are unevenly distributed across each country : they work in the hospitals serving large cities, whereas often most of the population is still located in rural areas. There are still too few antenatal consultations close to where people live : there is also some question as to their efficacy.

Maternities are both scarce and poor. Louise, for instance, was transported to a rural hospital where the nurse-midwife was powerless to save her : vaginal delivery was impossible, and she required resuscitation and cranioclasia. If the child had been alive upon arrival at the hospital, a caesarean section or a symphysiotomy might have saved both mother and child. Indira's father bought the necessary antibiotics in a private pharmacy, since the hospital was short of them : this delayed treatment and obliged him to incur a debt.

Planned parenthood activities are nonexistent. If Louise and her husband had been properly counselled, perhaps they would have preferred to use some contraceptive method such as the pill for a few years before deciding to have their first child. As for Kaltouma, she might have chosen to avoid this seventh pregnancy. Indira's death could probably have been avoided by a better education - that is, knowledge about her body and her sexuality - and by the existence of a planned parenthood consultation to which she could have gone for counselling.

(1) *The Traditional Birth Attendant in Seven Countries. Case studies in utilization and training.* In : *Public Health Papers.* N°. 75, 1981. WHO, Geneva.

MEDICAL CAUSES

Direct and indirect causes

All of these factors linked to the socioeconomic situation of developing countries represent constraints, which must of course be taken into account in any reflection on or programming of the fight against maternal mortality.

There were of course medical causes of the deaths of Louise, Kaltouma and Indira : mechanical dystocia, postpartum haemorrhage, post-abortion peritonitis. Table 4 shows the medical causes of maternal deaths : the direct causes ; that is, those that were completely connected with pregnancy, the indirect causes, or ailments occurring in a pregnant woman and causing her death (hepatitis, tuberculosis, malaria, etc.) and the accidental causes independent of pregnancy (a traffic accident, for instance). Further, there may be several causes involved in the death of a pregnant women. In such cases, an effort must be made to determine the main cause as well as the secondary or associated causes. For example, a preeclampsic woman who must undergo a caesarean section goes into shock under anaesthesia and dies. The main cause is the hypertension which calls for caesarean section, and the secondary cause is the anaesthesia.

Table 4

MATERNAL MORTALITY - THE MAIN AND SECONDARY CAUSES

A - DIRECT OBSTETRICAL CAUSES
1 - high blood pressure
2 - haemorrhage
3 - pulmonary embolism
4 - amniotic embolism
5 - puerperal infection
6 - ruptured uterus
7 - abortion
8 - extra-uterine pregnancy
9 - caesarean section
10 - anaesthesia
B - INDIRECT OBSTETRICAL CAUSES
C - ACCIDENTAL OR FORTUITOUS DEATHS
D - LATE DEATHS

Let us take another example : a caesarean section was performed on a woman with mechanical dystocia, rupture of the foetal membranes 2 days earlier and fever. She died of infection subsequent to her caesarean. The main cause of her death is mechanical dystocia, the secondary causes are infection and the caesarean section. Conversely, when a caesarean is performed on a woman before the onset of labour because of an abnormal pelvis detected during the 9th month, and results in death during or after the operation, the main cause of death is the caesarean.

The main cause and the secondary causes

It is not always easy to determine the main cause and the secondary causes : this is an exercise requiring the careful examination of each case history and it is not of purely statistical value. Reflection on each piece of information contributes to the team's experience.

There are several ways of classing causes of maternal mortality, as shown in figure 3. Direct obstetrical deaths may be divided into three types of pathology : haemorrhage, infections and abnormal pregnancies.

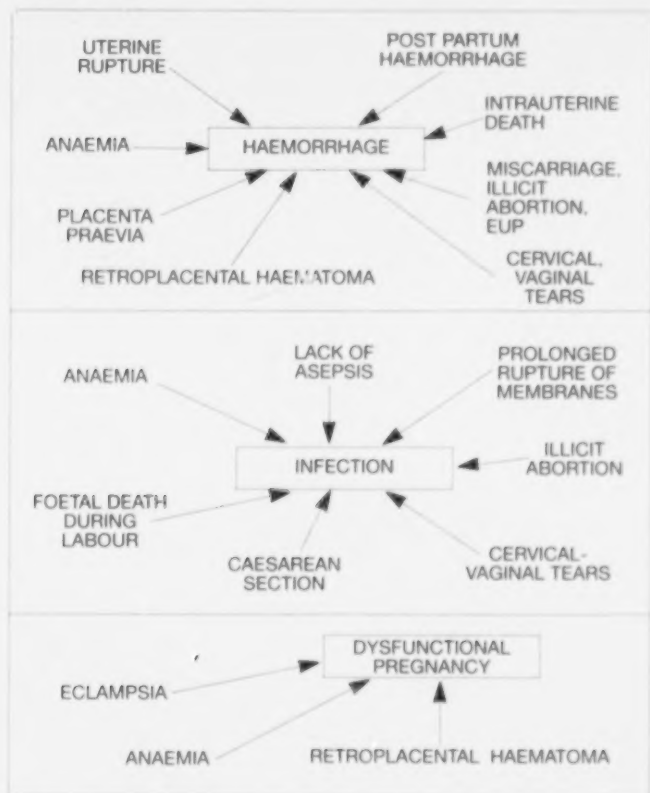


Figure 3 - Main causes of maternal death

It is also important to determine the frequency of each cause of death. Tables 5 and 6 show evidence that the causes of maternal mortality are the same in all countries, and do not change very much in the course of years (see findings for Benin in 1977 and 1987). These tables, most of which were established using

hospital-based studies, are certainly criticizable, but they do authorize extrapolations. This information is indispensable for the implementation of programmes for combating maternal mortality.

Table 5
MATERNAL MORTALITY

Cotonou - Benin (1)	1977- 95 cases	1987 - 244 cases
Haemorrhage	57,8 %	34,4 %
Ruptured uterus	48 %	30,9 %
Postpartum Haemorrhage	25 %	41,6 %
Placenta praevia	12 %	
Retroplacental haematoma	12 %	
Cervical tear	3 %	
Induced abortion		14,2 %
Extra-uterine pregnancy		5,9 %
Infections	23,1 %	27 %
Icterus	9,4 %	5,7 %
Post-surgical shock	4,2 %	
Eclampsia	3,1 %	
Anaemia		15,1 %
Abnormal pregnancy		9,4 %

(1) Source : Maternity unit headed by Professor ALIHONOU

Table 6
MATERNAL MORTALITY

N'Djamena - Tchad (1)	Number	Percentage
Direct causes	47	72,3
Eclampsia	12	18,4
Haemorrhage, anaemia, placenta praevia, retroplacental haematoma	14	21,5
Postpartum infection	10	15,5
Post-abortion infection	4	6,1
Ruptured uterus	4	6,1
Extra-uterine pregnancy	3	4,6
Indirect causes	18	27,7
Hepatitis, icterus	8	12,3
Concurrent infection during pregnancy	10	15,4
Concurrent tumour during pregnancy	0	0
Total	65	25
Total per 100 000 live births		956

(1) Source : N'Djamena Central Maternity Hospital, 1988

Although maternal deaths do have medical causes, the socioeconomic context in which they occur always plays a considerable role. While it is up to health agents to be aware of the essential role of education, the improvement of women's rights and of course economic development in the combat for lowering maternal mortality, they are not directly responsible for finding solutions to these problems. A number of proposals may be made, however, for the organization of the health system in the framework of this combat, and given the numerous constraints. These touch on antenatal consultations, conditions of home confinement, the surveillance of deliveries in obstetrics-gynecology units (maternities) and planned parenthood.

The study of the evolution of maternal mortality in the developed countries is most informative in this respect. The maternal mortality curve in Sweden (1) shows the role played by different factors in diminishing this mortality (figure 4). In 1751, maternal mortality (MM) figures were somewhere around 1,100 deaths for 100,000 live births; this is similar to the present rate in many African countries. Toward 1925, modern obstetrics was born with the low segment caesarean section. At that date MM had already dropped to 300/100,000. In other words, it went from 1,100 to 300/100,000 before the birth of modern surgery and the discovery of antibiotics (1944). Home confinement was the general rule at that time.

Decrease of maternal mortality

What is the explanation for this drop? First, there was socioeconomic development, with improvement of the standard of living, diet, housing and education. These factors played a considerable role, and led people - first in the upper classes and gradually in the other strata of society - to search for ways of limiting the

number of births, such as interrupted intercourse (withdrawal, or coitus interruptus) and the condom (masculine contraceptive). A better understanding of the mechanics of obstetrics led to improved birthing practices and to the invention of the forceps. Socioeconomic advances, improved home delivery procedures and the first steps toward birth control methods resulted in a two-thirds cut in maternal mortality. In France, despite the lethal effects of puerperal infection (2), its influence can be seen to decline between 1920 and 1980, long before



Figure 4 - Historical evolution of maternal mortality in Sweden (1751-1980).

Taken from PAPIERNICK, In: J. BOUYER et al, *Réduire la mortalité maternelle dans les pays en développement*, INSERM/ICC, 1989, 237 pp.

(1) E. PAPIERNICK, *Réduire la mortalité maternelle dans les pays en développement*. Pour un programme d'action. CIE-INSERM, Paris, 1989, 237 p.

(2) Puerperal infection: uterine infection in postpartum women, caused by a germ, the streptococcus, which developed in maternities and affected women following their delivery (see chapter entitled Referral centres).

the development of antibiotics and also before the origin of these infections was understood. Progress in hygiene such as handwashing, one of the greatest advances in human medicine, was decisive.

The drop from 300 deaths per 100,000 live births to 10 per 100,000 live births was achieved through the conjunction of medical advances (surgery, antibiotics) and of major changes in the behavioural patterns of pregnant women : the vast majority of these began to attend antenatal consultations and to give birth in maternities. These various factors, combined with a considerable decrease in the number of births (thanks to modern contraception) and the rising of standards of living, explain the extremely rapid evolution observed between the 1930's and the 1970's.

This study of the historical evolution of maternal mortality in Europe brings out the four major axes : properly performed home birthing (satisfactory hygiene), extensive use of antenatal consultations, delivery in maternities and planned parenthood.

In any case, this study shows that although underdevelopment is a terrible handicap, it does not prevent the implementation of large-scale action amongst the population at large, in order to improve the overall level of safety in childbirth. To do so, lessons must be drawn from the history of obstetrics, and at the same time there must be adjustment to prevailing constraints. It is out of the question, for instance, for a majority of women in developing countries to give birth in maternities in the coming years. Culturally, there is still much to be done to foster comprehension and acceptance of this practice among the population. Materially, this is often impossible (because of the distance, transportation and cost). Furthermore, health structures are generally unable to cope with the corresponding work load and the economy of these countries could not cover its cost. It is therefore necessary to improve the safety of home confinement, while detecting at-risk women requiring transferral to an obstetrical-surgical centre.

**PROVIDING
TRAINING : A
PRESENT-DAY
PRIORITY**

TRADITIONAL BIRTH ATTENDANTS

Indira and Kaltouma were "assisted" during their delivery by untrained traditional birth attendants. These women, also known as matrones, dais in India or let-thes in Burma, still take charge of the great majority of deliveries (up to 80 %) in many developing countries, especially in rural areas. Many countries are convinced that it would be unrealistic to exclude these women from the health system, and have organized programmes for the training and supervision of traditional birth attendants. India, Bangladesh and Indonesia seem to be most advanced in this direction. The fact that these women are well integrated in the community may facilitate the popularizing of some practices that contribute to lowering maternal and neonatal mortality ; these include the improvement of hygiene and of diet during pregnancy, the necessity of attending antenatal consultations and a better understanding of the advice given there, such as transferral to an obstetrical unit during at-risk pregnancies and counselling on birth control. Training of these matrones may also make home deliveries safer.

Such action may have greatly expanding effects : a single well-learned and properly performed act may affect all women and all neonates. For example, learning proper delivery of the placenta may avoid a great many maternal deaths caused by postpartum haemorrhage, one of the main causes of death.

The creation of a training programme for traditional birth attendants is a political decision : it requires determination to take advantage of the position of traditional birth attendants and through them, to give the entire community responsibility for its own health, and to trust their ability to learn. It must be clear that a programme of this type involves a long-term effort, which must extend over several months or even several years. Traditional birth attendants cannot be trained by a short workshop or a few days of courses in a university hospital ; they require repeated teaching sessions, workshops at the grassroots level, supervised sessions and refresher courses. The women must be volunteers, selected for their dynamism, their experience, their integration in the community and their educational level, on the basis of priorly well-defined criteria.

Financing must be set up in advance. Teachers, who in turn must be chosen for their motivation, must be trained, and the logistics of supervision planned. The training of traditional birth attendants is not cost-free, as is too often thought : a budget must be determined for it. While it is true that its impact can hardly be defined in economic terms, which perhaps explains why it is somewhat neglected, it does have an enormous effect on the population as a whole.

During these sessions, the implications of traditional beliefs should be analysed : these include dietary taboos during pregnancy, the application of clay, of animal excrements or other sub-

stances to the cord, the attribution of dystocia to a fault committed by the woman, who must confess it so that she may be delivered, ritual excisions, etc. It is a fact that traditional birth attendants are in the best position to influence customs and action, since they actually belong to the community, and they may then encourage proper health practices and explain the dangers involved in certain other types of behaviour.

These traditional birth attendants have often mothered large families themselves : they clearly cannot be convinced of the need to set up a birth control programme by simply telling them that it is dangerous to have a great many children. The issue must be discussed with them in a respectful way, so that they may gradually change their mind ; otherwise they will never be able to promote birth control within their community. Another constraint is illiteracy, which limits learning possibilities in some cases. Training programmes must take this element into consideration : some people have even suggested that training of traditional birth attendants be dispensed in conjunction with literacy courses.

ITS OBJECTIVES

It is important that the objectives formulated for training be realistic and susceptible of having a broad impact ; that is, that the acts and attitudes learned be appropriate for the most widespread forms of pathology. In most programmes elaborated in developing countries, the objectives set for training of traditional birth attendants involve the following skills :

- estimation of the date of onset and of the term of a pregnancy ;
- diagnosis and management of a miscarriage ; detection of suspected molar pregnancy and awareness of need for referral ;
- sending all pregnant women to an antenatal consultation, diagnosis of complicated pregnancies and decision on referral ;
- diagnosis of onset of labour ;
- diagnosis of engagement ;
- diagnosis of a complicated delivery ;
- application of rules for asepsis during delivery ;
- surveillance of the expulsion phase ;
- surveillance of delivery of the placenta, performing of controlled delivery and uterine massage, referral in case of complication ;
- aseptic cutting of the cord ;
- early neonatal care ;
- management of a torn perineum ;
- diagnosis and management of postpartum complications ;
- simple data collection ;
- some knowledge of planned parenthood.

All of these suggestions are valuable, since they aim at improving the health of expectant mothers and of their children. None should

CONTENTS OF PROGRAMMES

DIAGNOSIS OF PREGNANCY

be neglected, but some of them play a particularly important role in the fight against maternal mortality.

It is important for the subsequent surveillance of pregnancy to know how to diagnose it, and to date its onset. Diagnosis of pregnancy is based on one essential sign : the absence of menstruation, or amenorrhoea. During the first weeks of pregnancy, the patient often experiences nausea, with occasional vomiting. She is said to become "more beautiful", her chest swells.

The date of onset of pregnancy is determined by the date of the last menses, and by the size of the uterus. When the woman is seen at a later date this requires measurement of the uterine height, observing the date of the first foetal movements, and listening to the foetal heart sounds (see Appendix 3).

MISCARRIAGE

Any programme for combating maternal mortality should include knowledge on the problem of miscarriages and more generally, of haemorrhage in early pregnancy among its objectives. Such haemorrhages are a source of complications, some of which are serious, and which contribute to maternal morbidity and mortality.

When the woman is less than one month pregnant (6 weeks of amenorrhoea), there are two possibilities :

- either there is no bleeding and no fever, and abdominal palpation is not painful : surveillance is then sufficient ;

- or the woman is bleeding and has a fever. She has belly pains and abdominal palpation is painful. This patient should immediately be sent to a medical consultation, where the eventuality of an extra-uterine pregnancy (EUP) (1) must be excluded before delivering antibiotics for the treatment of endometritis and performing a curettage, since the egg has probably been incompletely evacuated. Curettage should be performed with caution, since an infected, soft uterus is easily perforated.

Beyond the first month of pregnancy, curettage should be performed as soon as possible, since expulsion of the egg is frequently incomplete at this point, and complications involving bleeding and infection are extremely frequent. The consequences of such complications are serious. They include anaemia, sterility (damaged endometrium and fallopian tubes), and even, occasionally, peritonitis (abdominal infection) and death.

Antenatal care

It is essential that all women be advised to attend an antenatal consultation.

Antenatal Consultations

Once trained, traditional birth attendants become "recruiting agents" for the antenatal consultations within their community. Having correctly understood the importance of follow-up during pregnancy, they are able to convince women to attend these consultations. They are capable of explaining the advice given there, and of making sure it is followed. This multiplies the impact of consultations.

(1) EUP : see chapter "Referral centres"

When antenatal consultations are too far from the woman's home and no mobile consultation has been set up, the trained traditional birth attendant may contribute to the detection of certain risk factors.

Shortness, scoliosis or limping may cause difficulties during delivery. Simple use of a measuring rod or of a 150 cm-long stick, or simple observation are enough to detect this.

Since they are familiar with the women in their community, traditional birth attendants are able to identify those whose obstetrical history is already marked by an incident (perinatal death, haemorrhage, forceps delivery, etc), those who are very young or very old, those who have many children or pregnancies at short intervals.

If they are attentive, they will notice those women who are tired, undernourished, anaemiated or suffering from a protracted illness (tuberculosis, ...).

Their training will teach them that vaginal bleeding, however slight, is dangerous, as is the development of oedema, headaches, icterus, fever, uterine contractions before the 8th month, lack of foetal movements, a burning sensation during urination or foul-smelling vaginal discharge. One of their main tasks is then to persuade these women and their families of the need for medical help.

The following instructions on when to send a woman to the maternity may be of help to traditional birth attendants.

During pregnancy :

- bleeding ;
- excessively white conjunctiva ;
- lower abdominal pain ;
- oedema and headaches ;
- foul-smelling vaginal discharge ;
- pain when urinating ;
- a baby with a presenting part other than the head ;
- a baby that stops moving and whose heartbeat can no longer be heard.

During delivery :

- bleeding early in labour ;
- labour lasting more than 24 hours ;
- presenting part other than the head or breech (transverse lie, shoulder presentation, etc.).

After delivery :

- abundant bleeding before delivery of the placenta ;
- placenta not expelled 1 hour after childbirth ;
- incomplete placenta or haemorrhage with red blood ;
- large tear in perineum ;
- fever during the first days following delivery ;
- foul-smelling vaginal discharge following delivery ;
- abscess of the breast.

DELIVERY

By definition, a normal delivery is one which takes place with no complication, but it should also be performed in complete respect of the rules of asepsis.

The presentation is normal when the child's presenting part is the head or the buttocks. The presentation and the location of the baby's back may be determined by abdominal palpation. The uterus is longitudinally lengthened. The fingers will find the hard, regular cephalic pole, the furrow corresponding to the neck and the flat of the back, with the limbs on the opposite side. The woman herself may indicate the side on which she feels the strongest foetal movements : this locates the limbs. Auscultation of the heart sounds may also be quite useful : the clearest location is close to the mother's symphysis in case of a head presentation, and close to the navel or higher, in case of a breech presentation. The strongest sounds come from the side corresponding to the baby's back.

A transverse lie

A transverse lie requires emergency transferral to a maternity, since delivery is impossible. The uterus is stretched crosswise, with the cephalic pole felt laterally (left or right hypochondrium). This is an extreme emergency : the lives of both mother and child depend on the rapidity of the decision to transfer the woman, and on the duration of conveyance.

If labour and expulsion progress normally, birth occurs within 24 hours for a primipara ("the sun should not set twice on a primipara in labour"), and within 12 hours for a multipara. If they take any longer, the patient should be transferred immediately to a maternity for an instrumental extraction, a symphysiotomy or a caesarean section, except if delivery is imminent.

Labour may take an abnormal course for a number of reasons, including the following three :

- foetopelvic disproportion : when the pelvis is contracted, delivery cannot proceed through the maternal passages. This anomaly can generally be detected, or at least suspected in the course of pregnancy, and confinement in a surgical obstetrical unit should then be planned for the patient. This again shows the primary importance of antenatal consultations in reducing the frequency of this major cause of maternal and foetal deaths ;

- brow presentation : this presentation is identified by locating the nose. Delivery is impossible. This is a surgical emergency ;

- undiagnosed transverse lie : at this stage in labour, one arm will probably be prolapsed. As in any prolapse (cord (1), feet, arms), the golden rule is never to pull on a part that descends into the vulva and never to sever anything. At this point, both mother and child may be saved if they are sent to a surgical unit rapidly.

(1) Prolapse of the cord : foetal prognosis is very poor, except if the patient is only minutes from a centre in which an emergency caesarean section may be performed, and even then, only if a manual intrauterine manipulation pushes the presentation back inside, thus preventing it from pressing on the cord.

Rupture of the uterus and infection

However, regardless of the cause of abnormal labour, two extremely serious complications are to be feared : rupture of the uterus and infection. These are the main causes of maternal and foetal mortality. One aftermath of this type of delivery may be the development of a vesico-vaginal fistula (VVF). Last, prolonged labour often results in another frequent, lethal complication : postpartum haemorrhage.

To facilitate expulsion, the patient is encouraged to push when the presentation (breech or head) is engaged in the pelvis. When gentle pressure is exerted on the perineum, using two fingers, the presentation is visible (hair, buttocks). The woman herself often experiences a strong desire to push at this stage.

Birth attendants who have learned to perform a manual vaginal examination encourage the woman to push when dilatation is complete : that is, when no cervical rim is felt, and the engagement is confirmed by Farabeuf's sign : the head is engaged when there is just room for 2 fingers to be lodged between the perineum and the presentation (figure 5). Under no other circumstance should a woman be encouraged to push.

During contractions, women should not be requested to make more than three efforts per contraction. Breathing should be deep and calm.

Uterine expression may be envisioned when there is no doubt that the presentation is engaged in the pelvis, that the presenting part is the head (no expression for a breech) and that expulsion is difficult and excessively protracted (more than 30 minutes in a multipara and 45 minutes in a primipara). It should be done gently, either by placing the palms of the hands on the fundus of the uterus or with the help of the forearm, during a contraction and while the woman is pushing.

When the head has distended the perineum, the latter should be protected by helping the child's head to emerge. An over-rapid delivery of the presenting part should be prevented, since there would be a risk of perineal laceration. The head should be guided out by the right hand, which gently pushes back the posterior perineum, using a clean

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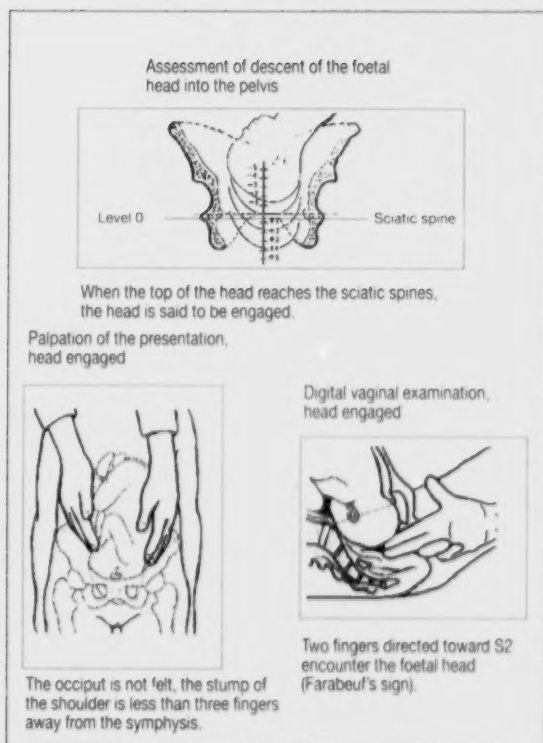


Figure 5 - Study of engagement
Taken from J. LAÏCAC, G. BODY et al, *Pratique de l'accouchement*, Villeurbanne, SIMEP, 1988.

cloth, then facilitates expulsion, while the left hand which holds it firmly (see figures 6 and 7).

Once delivered, the head spontaneously turns toward the back. The rotation is completed, gently, using one hand, bringing the occiput to the rear. This results in delivery of the first shoulder, which is seen under the symphysis. Both hands are then placed on the skull (and not on the neck), and the head is gently drawn downward, then upward. Attention should always be paid to the perineum during this manipulation (see figures 8, 9, 10 and 11).

The role of hygiene

During labour and expulsion, hygiene and asepsis should be as strict as possible. At the beginning or in the course of labour, the woman should be asked to urinate and to defecate, to wash her hands and genitalia carefully with soap and water, and also to wash her legs and feet and to put on clean clothing. She should be placed on a clean bed or mat.

Boiled water, soap and clean linen should be available. The birth attendant should wash her hands with great care, using soap (and scrub them if possible) before each manual vaginal examination (one every four hours) and before the manipulations facilitating expulsion. During expulsion, the woman's genitals should again be washed with soap and water. If a fingerstall or glove is available, it should be sterile (washed, powdered with talcum powder, kept in formaldehyde) and changed after each manipulation.



Figure 6 - Expulsion.
Ibid, p. 56.



Figure 7 - Delivery.
Ibid, p. 56.



Figure 8 - Delivery of the
shoulders. *Ibid*, p. 57.

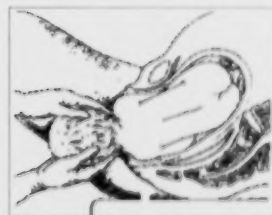


Figure 9 - Delivery of anterior
shoulder. *Ibid*, p. 57.



Figure 10 - Delivery of
anterior arm. *Ibid*, p. 57.



Figure 11 - Delivery of
posterior shoulder. *Ibid*, p. 57.

CONTROLLED DELIVERY OF THE PLACENTA

The birth attendant should possess a box containing two clamps, scissors and surgical thread. These instruments should be sterilized in boiling water and flamed before use. Sterilization may also be achieved by the use of formaldehyde pills. Surgical thread should be sterilized using alcohol. If a razor blade is used to cut the cord, it should be new, sterilized over a flame and discarded after use. The box containing the instruments should only be opened when needed. Alcohol is applied to the cord. The vulva is again washed after delivery. A clean cloth is placed on the vulva if it is torn, and is frequently replaced.

In case of protracted labour, the woman should be given sweetened water and light food.

The woman's position during expulsion will depend on local customs, which should be respected : either lying on her back, with legs and thighs in hyperflexion on her abdomen, or crouching down, with support. Delivery should take place in a clean, well-aired room.

This is the pre-eminent life-saving procedure. As seen above, haemorrhage is often the main cause of maternal death, and postpartum haemorrhage is one of its most frequent forms.

When is postpartum haemorrhage to be feared ?

- when labour goes very rapidly or is too drawn out ;
- when the baby is large, the uterus is distended by too much amniotic fluid (hydramnios) or by a twin birth (it has difficulty in retracting following prolonged distension) ;
- in grand multiparas ;
- during partial or total retention of the placenta ;
- in case of a past history of postpartum haemorrhage.

In fact, it is always an eventuality in any delivery. In normal delivery of the placenta, the uterus remains at rest for awhile, and contractions resume again 20 to 30 minutes after the child is born. At first, the uterus retracts after childbirth, and the placenta then separates and a haematoma is formed. The contractions then expell the placenta.

Separation of the placenta

Separation of the placenta is confirmed when the part of the cord located outside of the vulva is lengthened. The woman then needs only to push moderately in order to expell the placenta : this is spontaneous delivery. She may also be helped by a manipulation in which the right hand holds the cord slightly taut, without ever pulling on it, for there is a risk of tearing it out, while the left hand is placed under the symphysis and pushes the uterine mass back into the abdomen. Separation is definite if the cord does not move back up with the uterus. The palm of the left hand should then seize the fundus of the uterus, return it to its median axis and

press downward, while the right hand continues to maintain some tension on the cord so as to guide the placenta out. This is what is known as controlled delivery. The left hand then continues to massage the uterus so that it retracts properly as soon as possible, producing a satisfactory globular uterus (a small, very firm uterus located between the symphysis and the navel). Like controlled delivery, uterine massage is a life-saving procedure (see figures 12 and 13).

Examination of the placenta

The placenta should be systematically examined : it is placed on a loincloth or a tray, under good light, and reassembled. All blood clots are removed, and the maternal side examined. The cotyledons should all be present. There should be no hole or empty space. On the foetal side, the membranes should be unharmed ; this is checked by lifting them. Blood vessels reaching over the membranes and ending suddenly may be indications of a missing or abnormal cotyledon, retained in the uterus. An incomplete placenta requires uterine inspection and/or curettage as soon as possible, and the patient must therefore be transferred to a nearby hospital or clinic staffed by personnel competent in this skill.

Artificial delivery

Sometimes the placenta does not separate, controlled delivery fails, massage of the fundus of the uterus does not induce contractions. No forcible manipulation should be attempted under any circumstances, nor should the cord be pulled : this can only fail, and may cause haemorrhage as well. The latter is the main risk, and the patient should then be evacuated as soon as possible. Any patient who has not expelled the placenta one hour after childbirth should be transferred to the nearest centre so that artificial delivery may be performed.

During the transfer, the traditional birth attendant should remain with the patient, since she is the only person who can intervene :

- by continuing to stimulate the uterus gently, so that the placenta may separate itself ;
- by continually massaging the fundus of the uterus, to combat atonicity ;



Figures 12 and 13 - Expulsion of the placenta
Ibid, p. 69.

SURVEILLANCE OF THE PUERPERIUM

- in case of severe, life-threatening haemorrhage due to uterine atonicity, the matrone should perform two-handed uterine massage : the fundus is seized in the palm of one hand, while the other hand, well washed and brushed, is inserted into the uterus, through the cervix, and the closed fist is held there. This position should be maintained until arrival at the hospital ;

- when transfer is out of the question, the matrone should be able to send a messenger to a referral centre, to request a vehicle. Here is an example of a standardized message used in Sudan by illiterate traditional birth attendants (figure 14).

A trained birth attendant never calls a delivery normal until it is completed. She should be aware that a complication may always arise, and that the life of her patient will then depend on her decisions. These should always be based on calculation of the amount of time required in case transfer is necessary. Better still, when possible, a means of transportation should be made available or easily obtainable for every delivery.

During the hours immediately following delivery of the placenta, the birth attendant should not leave her patient, and should act as follows :

- check on her state of consciousness ;
- check on the uterine shape. The uterus should remain globular, retracted and firm, and there should be no bleeding. Kaltouma died of postpartum haemorrhage within minutes ;

- check for perineal tearing ;
- feed the woman and help her to get up ;
- neonatal surveillance : colour, breathing, temperature. First suckling.

The birth attendant should visit her patient at home once a day thereafter, for one week, to check on her health. Hospitalization is required in three cases :

- presence of fever, shivering, abdominal pain, foul-smelling vaginal discharge, an excessively enlarged, soft uterus are signs of endometritis (infection of the uterus, often caused by insufficient asepsis during labour) ;
- severe perineal tear, reaching the anus, requires surgical repair. This is more frequent in excised women, whose tissues are less flexible and tear very easily and often very seriously. Excision, and especially the extensive, pharaonic operation, may in fact constitute indications for delivery in a maternity unit ;

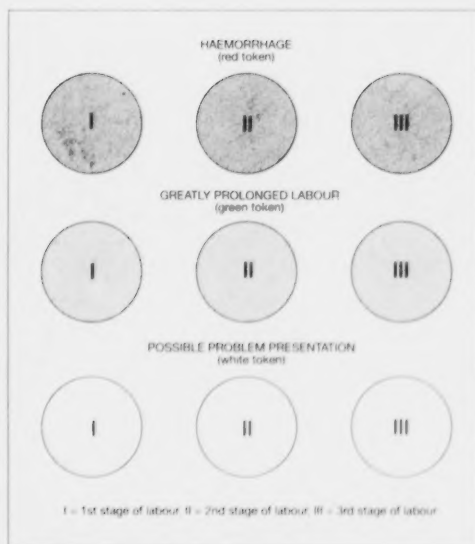


Figure 14 - Standardized message (Sudan)

Taken from A. MANGAY-MAGLACAS and H. PIZURKI, *Public Health Papers*, Geneva, WHO, 1981, n° 75.

- redness, heat, a very painful, fluctuant mass in the breast are signs of an abscess.

BIRTH CONTROL

The traditional birth attendant also has an important role to play within the population in this respect. She should suggest that her patients resort to birth control or sterilization, and encourage them to attend a consultation so as to choose the best method. Her training enables her to give advice as to the practical aspects of the technique chosen, to correct mistakes and combat misconceptions. This training in planned parenthood is more than the simple acquisition of "scientific knowledge", since it may come up against traditional practices, a way of life and popular beliefs. The community must accept the birth attendant, and trust her; otherwise she will be afraid to introduce ideas that are difficult to accept, and of which she herself is not thoroughly convinced. This is the greatest obstacle to a planned parenthood programme in a community where incomes are low and infantile mortality is high. Emphasis must be placed on pregnancies occurring at excessively short intervals, at a late age, undesired or in overly young girls who are still growing. The problem may be partially solved for the latter group by a modification in the legal age of marriage.

DATA COLLECTION

Training of traditional birth attendants should enable them to perform simple data collection for statistical purposes. This does not directly affect maternal mortality, but it does contribute to:

- precise knowledge on the number of deliveries in a given community;
- a better assessment of health needs;
- supervision of the work of trained birth attendants, through refresher courses aimed at increasing their knowledge and skills in accordance with the actual difficulties encountered. This supervision should also consider cases referred by the traditional birth attendants and their relevance, so as to gradually improve their efficacy. This data collection should not be analysed at the central level only, but should constitute a tool for those trainers in charge of visiting the birth attendants regularly. Illiterate birth attendants may call on a member of the community for help in this work.

EVALUATION

As mentioned above, the results achieved through the training of traditional birth attendants can hardly be quantified. It is clear that for a given pathological condition, the techniques used in home deliveries will be less effective than those practiced in a maternity. There is no doubt, for instance, that home treatment of postpartum haemorrhage is not necessarily successful, whereas the techniques implemented in hospital are definitely superior. All women suffering from postpartum haemorrhage at home will not be saved. However, the training of birth attendants will put a greater proportion of the population in contact with more competent personnel, and we may be sure that a great many maternal deaths will then be avoided. Be that as it may, there is no other solution available in most developing countries, at present, before many more hospitals are set up and able to offer services that are suffi-

cient in quality and quantity, and accessible to the majority of the rural, urban and underprivileged population.

Training programmes for traditional birth attendants should be based on clear educational objectives defined on the basis of an analysis of the situation and of the needs evidenced. The type of training (in hospital, in the field...), its duration and rhythm may vary from one country to another. In any case, these birth attendants should receive proper recognition (by village and governmental officials, diplomas, interconnections allowing for advancement, pay...). Furthermore, they should have their place on the health worker organization chart, and should be esteemed and respected by the staff of both the antenatal consultation and the maternity, with whom contacts should be as close as possible, so that their action will have the greatest possible impact on families.

During their training, birth attendants are equipped appropriately for their action ; they are in charge of ensuring maintenance of this equipment, but it should be renewed at regular intervals. This is done during supervisory visits, at the birth attendant's own place of work. These visits serve to evaluate the relevance of the course, its application (knowledge, work done correctly, quality of referrals), the woman 's influence within the community and data collection. This supervisory work should also yield indications for the refresher programme and its periodicity. Thus, through their satisfactory participation in the health system, and thanks to their integration in their native community, traditional birth attendants should participate actively in improving the health status of mothers and children.

THE ANTENATAL CONSULTATION

The antenatal consultation, (ANC), an essential component of the fight against maternal mortality, must make every effort to care for all pregnant women. The facilities in which the ANC is held must be close to women's homes ; this involves complete decentralization, or else the use of a mobile ANC unit.

The number of antenatal visits per pregnancy depends on the material and human resources available. One main rule is that a single antenatal visit for all pregnant women is preferable to 3 or 5 visits for a minority of them. The greatest risk factors may be detected in a single visit. The role of traditional birth attendants in increasing awareness and providing guidance for families is essential, as seen above, but the help eventually provided by women's organizations (1) and by village and governmental authorities should not be overlooked.

The ANC can only be effective if health and social workers are able to cooperate and work hand in hand, provided both services exist, of course.

Many studies attest to the importance of ANC. A single example may suffice. In Zaria, Nigeria (2), the MM rate is 130 for women seen at the ANC. It rises to 2,860 (22 times higher !) for women not seen there. This is due to the fact that women who attend consultations are referred to specialized services at an earlier date, when necessary, whereas those who have not been seen there arrive late and suffer from severe complications. In every instance, the difference is statistically significant, to the detriment of women receiving no antenatal care : number of extractions, of uterine ruptures, of still-births, of transfusions, etc. In the historical analysis of the evolution of MM in industrialized countries, the generalized, routine antenatal care accounts for much of the major decrease in MM rates.

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OBJECTIVES

The ANC are directed toward the following objectives :

- detection of at-risk pregnancies and implementation of proper management (MAN), with the help of the antenatal consultation card ;
- diagnosis and treatment of potential causes of medical complications during pregnancy ;
- preventive action ;
- provision of health education for pregnant women ;
- data collection.

(1) LEKE et al. *Introduction of high risk pregnancy care in rural Cameroon : health source research approach.* J. Obst. Gyn. East Cent. Afr. 7.7.88.

(2) Kelsey A. HARRISON, *Child bearing, health and social priorities : a survey of 22,774 consecutive hospital births in Zaria, Northern Nigeria.* In : British J. of Obst. and Gynaecol. 1985, Supplement n° 5, Oct.

DETECTION OF AT-RISK PREGNANCY- MANAGEMENT

The notion of risk is an extension of the cardinal rule : "to each according to his/her needs". This rule implies :

- concentration of care on those individuals or groups of individuals whose needs are greatest ;
- the improvement of guidance-referral ;
- the adaptation of personnel training ;
- the orientation of governmental social and health policies.

Risk factors exist for specific individuals : for instance, a pregnant, hypertense woman runs the risk of complicated labour. The risk, measured for herself and for her child, is the expression of a need for prevention and cure. Hypertension plus pregnancy, then, constitutes a signal, and their combination should be used to guide action : decisions as to distribution of resources, most appropriate system of coverage and of guidance-referral, or putting people on the right track.

Everywhere in the world, there is a group representing 20 to 30 % of all pregnant women who present 60 to 70 % of child-bearing and delivery complications. Efficacy will be greatest if available means are concentrated on this group of "high risk" women, and this is particularly true when such means are limited.

The aim is the identification, at the ANC, of women belonging to this "high risk" group ; that is, of those presenting one or several risk factors. A risk factor during pregnancy is a characteristic whose presence is indicative of a strong chance that the pregnancy will be complicated. This is a probability (1), then, and the extent of this probability depends on the risk factor.

Certain risks entail a very high probability of occurrence of a complication. For example, a very contracted pelvis will almost inevitably result in the mechanical impossibility of vaginal delivery. For some other factors, the probability may be lower. And last, for certain pathological conditions, risk factors are not easy to identify and accurate prediction is not feasible. This is the case for retro-placental haematoma, which may develop without warning.

The main risk factors

The main risk factors are now well known, since several studies have been conducted among broad population samples in both industrialized and developing countries. Only prevalence may vary, and it should be determined by local studies based on child-birth records.

Some factors indicative of a high risk of maternal mortality and valuable for identifying these women are present even before pregnancy, while others develop in the course of gestation, and still others during delivery (see chapter Referral centres).

(1) Probability : the risk that a foreseeable event will occur.

Risk factors present before pregnancy

Age	< age 16 and > age 35
Height	< 1.50 m
Parity, multipara	Para > VI
Educational level	Illiteracy
Social status	unwed, widow
Socioeconomic status	low
Workload	high
Length of time since last delivery	< 2 years
Overall health status	cough, fever, chronic disease
Obstetrical history	still birth, intrauterine death, vacuum extractor, forceps, caesarean section (scarred uterus), severely torn perineum or ritual excision
Heart disease	murmur + or -

Age

Age is an important factor to consider. Mortality is high in pregnant women over 35 years of age, and increases rapidly with age. Anaemia, ruptured uterus, postpartum haemorrhage are the main conditions encountered. Older age is often linked with grand-multiparity. Pregnancy in an adolescent is a high risk factor. Growth is not yet ended, and nutritional requirements are high. In addition, there are many unmarried girls in this group, and many problem patients whose social integration is poor, and who do not attend ANC. Undesired pregnancies abound, and psychological problems are considerable. The main complications are severe anaemia, pregnancy toxemia (high blood pressure, preeclampsia, eclampsia) and mechanical dystocia.

Social status

Social status may provide some indication, since poverty (often associated with illiteracy and malnutrition) is a major risk factor. Widows and unwed women, who are often in dire straits or social outcasts, have a high rate of MM, as a group.

Parity

It is important to be informed of parity, since the risk of dystocia and postpartum haemorrhage is greater for primiparas, and particularly so when they are very young. Grand multiparas run the same risks as women over 35, and the two factors are often combined.

Height

Height is an important piece of information, since some research has shown that the risk of mechanical dystocia decreases as height increases (table 7).

Table 7
MATERNAL MORTALITY - RISK FACTORS

	primiparas ≤ age 15	primiparas ≥ age 25	grand multiparas ≥ age 30	others
AGE - PARITY				
Pregnant women	6 %		10 %	
Maternal mortality	30 %		20 %	
Eclampsia	40 %			
Foetomaternal disproportion	20 %			
Delivery with prolonged labour	18 %			
Perinatal deaths	180 %		150 %	100 %
Vesico-vaginal fistula (79 in the series)	21	9		

Taken from a study of 22,774 births in Zaria, NIGERIA, 1985.

Heart disease

Heart disease in general and post-rheumatic heart disease in particular, require hospitalization when the term is neared, and use of forceps to limit the woman's need to push.

Risk factors developing during pregnancy

Genital bleeding	regardless of amount of blood and date of occurrence in the course of pregnancy
Extensive oedema (fingers, lower limbs, face)	present (pitting on pressure)
Weight gain	sudden, great (change in curve)
Blood pressure	minimum above 90 mmHg
Albuminuria	++ pyuria
Foetal position	transverse lie, breech
Multiple pregnancy	twins, triplets
Prolonged pregnancy	> 43 weeks
Intrauterine death	disappearance of foetal movements
Pallor	haemoglobin concentration < 10 g/l
Malnutrition	weight/height < 80 % of reference figure
Antenatal care	no record at ANC

Genital bleeding

Genital bleeding is always a warning sign, and should systematically lead to referral. During the first trimester it may be an indication of a spontaneous miscarriage, or of an ectopic pregnancy (extra-uterine pregnancy). During the third trimester it may be a sign of a placenta praevia (placenta inserted in the lower part of the uterus) or of a retroplacental haematoma.

Oedemas

Oedemas may result in a change in the weight curve : in their presence, the other signs of the preeclampsic triad should be sought : hypertension (above 130/80 or 140/90, depending on the population group) and albuminuria (above two crosses). When one of these three signs is encountered, medical consultation or hospitalization is required.

Foetal position

A transverse or pelvic (breech) foetal position during the third trimester should incite transferral to a referral centre. Following elimination of the hypothesis of pelvic vitiatio (deformed pelvis) or of a praevia tumour (fibroma, placenta praevia), a transverse lie may be verticalized and version of a breech presentation effected by external manipulations. Failing this, caesarean section is necessary.

Multiple pregnancies should be systematically referred, for delivery may require special manipulations or caesarean section. In prolonged pregnancy, delivery should be induced rapidly, short of which intrauterine death may occur, with ensuing coagulation disorders the effects of which are tragic for the mother.

Anaemia

Anaemia is a highly prevalent risk factor, affecting up to 80 % of women in some studies. It is identified as a concurrent factor in most gravidic pathologies. Action should not await the development of functional signs such as shortness of breath or faintness due to exhaustion, since these women's organism tends to adjust to such chronic anaemia, and when the signs do occur they very often indicate extremely severe anaemia (haemoglobin concentration < 6 g/l). Hospitalization is necessary in this type of anaemia. Management is the same as for severe malnutrition.

An average of 11 kg should be gained during pregnancy, but the figure for weight gain depends on the woman's nutritional status at the onset of pregnancy. An emaciated woman with low reserves absolutely must gain sufficient weight, whereas a woman who is overweight at the beginning of her pregnancy may content herself with a low weight increment and still give birth to a child with a satisfactory birth weight. The desirable weight gain should be defined in accordance with the woman's pre-pregnancy height and weight (see "CHILDREN IN THE TROPICS", 1985, n° 159, p. 19).

Definition of risk factors

When a risk factor is discovered, the nurse, midwife or doctor must make a decision. The advance definition of rules guiding this decision is known as management (MAN). The ANC card should mention each risk factor and the appropriate MAN. For instance : if, in a certain community, it has been proved that women having borne more than eight children run a definitely higher risk of uterine rupture, the task of health workers is to refer all women who are grand multiparas (in this case, over Para VIII) to the maternity for their delivery. They may then be monitored correctly, and benefit from the procedures required by their condition. The ANC card is a decision-making facilitator in this case (see Dar Es Saalam ANC card).

Management

AN EXAMPLE OF A MANAGEMENT
CARD FOR ANTENATAL CONSULTATIONS
DAR ES SAALAM - TANZANIA (1)

Risk factors

Decision

Hospital delivery	*
Refer to doctor	**
Immediate referral to hospital	***

1. Age below 16	*
- over 30 first baby	*
- over 35	*
2. Past obstetric history :	
- 10 or more pregnancies	*
- last pregnancy over 10 years ago	*
- caesarean sections	**
- vacuum extractor or forceps	*
- 3rd stage complication e.G. post-partum haemorrhage or manual removal of placenta	*
- stillbirth in last pregnancy or more than 1 neonatal death	**
- neonatal death in last pregnancy or more than 1 neonatal death	**
- 3 or more repeated abortions	**
3. Maternal physical development :	
- height of 146 cm or less	*
- limp or polio leg	*
4. Maternal disease :	
- bleeding since last period	***
- clinically anaemic	***
- BP 140/90 or more	***
- oedema and proteinuria ++	***
- Sputum positive for AFB	***
5. Abnormal presentations :	
- Breech	*
- Transverse lie	*
- Large for dates or suspected twins	*

Distribution of risk factors : 2,367 at-risk pregnancies for
13,410 = 17.65 %

Combination of risk factors :

height below 146 cm alone	1,154 women
height below 146 cm and past history of stillbirth	134 women
height below 146 cm and past history of neonatal death	134 women
height below 146 cm and past history of stillbirth and neonatal death	23 women
	1 445 women

Height of 146 cm or less accounted for 41.6 % of all risk factors detected.

Eighty-one per cent of the total risk factors were detected from the patient's history and height measurement. A single ANC visit sufficed for this !

(1) ESSEX, ECERETT. Use of an action-orientated record card for antenatal screening. In : Tropical Doctor. 1977, 7, pp. 134-138.

While certain risk factors are easy to determine (a uterus is or is not scarred, for instance), others may require investigation, since they require the definition of a threshold beyond which a risk is definitely incurred. This is the case of hypertension. It has been discovered that the figures above which blood pressure may be said to be abnormally high vary from one population group to another. The threshold is generally set at 140/90 in Europe and North America. Studies conducted in West Africa show the threshold there to be 120/80. This is important, since it affects antenatal surveillance, and may distort it.

A similar problem arises for the definition of the height below which a woman should be routinely referred to a referral unit for delivery. For example, in a given population it is noted that almost all cases of mechanical dystocia occur in women measuring less than 1.50 m. Furthermore, one third of all pregnant women measure less than 1.50 m. It is clearly out of the question to send all such women to maternities for delivery, since many women with a height under 1.50 m will give birth normally. In addition, there is not enough room in maternities to admit 1/3 of all pregnant women on the basis of this risk factor only. Last, it would be difficult to persuade the population to consent major efforts for so imprecise a risk. The risk factor is then said to have a high specificity but a low sensitivity.

Theoretically, the decision to deliver all women measuring less than 1.50 m in maternity wards would result in the elimination of maternal deaths caused by mechanical dystocia, but the cost to society in terms of facilities and cost to families would be unacceptable. Investigation must then be refined, to define the exact height below which pregnant women in this community should be referred. This height factor should have the best possible sensitivity and specificity (the two vary conversely) : fewer women will be referred, but those who are will have a much higher risk of mechanical dystocia than the rest of the population. The definition of this risk factor will then be acceptable for the given population and for the health system.

It is not easy, then, to single out risk factors. This requires the study of the physical, medical and socioeconomic characteristics of the population as well as of those pathological conditions which account for maternal and perinatal deaths (1).

Such a study is based on the data collected at antenatal consultations and by maternity units. The choice of risk factors should take into account :

- their frequency within the population ;
- their impact on maternal deaths ;
- their acceptability (for the population and for referral centres).

(1) *Perinatal death : death of a child between the 7th month of gestation and the 7th day of life.*

*The frequency of visits
to ANC*

The necessary statistical analysis can only be performed if workers in antenatal consultations and maternities collect data carefully, strictly and in a disciplined manner (1).

The frequency of visits to ANC per pregnancy depends above all on the resources allocated to this activity. The minimal objective, which would represent a definite progress in many countries or regions, is one visit per pregnancy for all expectant mothers. It is a fact that the presence of one or several of the most important risk factors -that is, age, parity, height, obstetrical history of scarred uterus or perinatal death (intrauterine death, still-birth, death during the first week of life), problem delivery requiring a manipulation (vacuum extractor, forceps), postpartum haemorrhaging, perineal tear- may be detected by a single visit.

However, most often this single visit cannot detect some of the abnormalities or complications of childbearing which are equally life-threatening for mother and/or child. These include :

- uterine height too short for term, indicative of retarded intrauterine growth (small for date baby). This may be caused by foetal pathology (chromosome anomaly, malformation), but is most often due to maternal pathology (anaemia, malaria, intestinal parasitosis, physical exhaustion, hypertension...). An insufficient uterine height for term may also indicate an erroneous estimation of the term, however ;

- excessive uterine height for term is suggestive of a large baby (the pelvis should then be examined carefully), a twin birth, or erroneous estimation of the term ;

- anaemia, diagnosed by conjunctival pallor, shortness of breath and fatigue, is an important sign, and it should be recalled that anaemia ranks high among the major causes of maternal mortality ;

- hypertension and oedema are evocative of pregnancy toxemia or preeclampsia ;

- any bout of metrorrhagia, regardless of its magnitude, is suggestive of placenta praevia, or of retroplacental haematoma when associated with hypertension ;

- a concurrent pathological condition may also be involved. These include malaria, urinary infection, jaundice, sexually transmitted diseases, etc.

However, a single antenatal consultation may suffice to initiate routine iron supplementation and administration of nivaquine, give advice on diet, talk about possible difficulties during delivery (for instance, what to do if bleeding occurs, or if the membranes are ruptured, etc.), and provide information on breast-feeding and planned parenthood.

When advance planning of two or more antenatal visits is feasible,

(1) B.T. NASAH, "The management of pregnancy". in : *Children in the Tropics*. International Children's Centre, Paris, 1976, n° 105, p. 5.

DIAGNOSIS AND TREATMENT OF PATHOLOGICAL CONDITIONS

Urinary infections

women should be advised to consult at the beginning of the 2nd trimester and in the course of the 3rd.

At the first visit, the woman's medical history, height and weight, the duration of gestation, foetal movements and heart sounds should be recorded. Iron supplementation and treatment with nivaquine are then initiated, and a first tetanus vaccination administered.

During the 3rd trimester, the pelvis must be examined, and weight gain and the evolution of uterine height assessed. High blood pressure, metrorrhagia or a faulty presentation may be detected. Iron supplementation and nivaquine treatment are continued, along with immunization against tetanus (see ANC card for Burundi).

Potentially complicating conditions for pregnancy are urinary infections, malaria and tuberculosis.

These are more frequent in expectant mothers. The at-risk group is mostly characterized by women with a history of urinary infection outside of pregnancy. Neglect of the relatively silent forms may result in the rapid development of acute pyelonephritis (kidney infection) which, if neglected or improperly treated, may cause fatal septicaemia.

Cystitis, characterized by pelvic pressure, frequent, urgent need to urinate, burning sensation during micturition and stress incontinence, must therefore be treated by antibiotics (penicillin and related drugs, cephalosporins).

When a laboratory is available, a bacteriological diagnosis may be performed, provided several rules are strictly observed in the collection of urine : the vulva must be carefully washed, the middle part of the stream taken and tested immediately (direct examination and culture).

The symptoms of acute pyelonephritis are faintness with shivering and high fever, unilateral lumbar-iliac pain (usually on the right side) and lower urinary tract signs (see cystitis). Palpation of the lumbar fossa is painful. Treatment involves strict rest and large amounts of fluid, and requires early antibiotherapy (penicillin and related drugs, cephalosporins).

Complications are often caused by delayed or insufficient treatment. Impairment of general health is observed, with fever, disordered consciousness and shivering, along with cardiovascular collapse and respiratory distress.

The diagnosis may be difficult in the absence of a laboratory.

There is a kidney infection, which may progress toward a renal abscess and septicaemia, with secondary locations through the dissemination of germs in the bloodstream, possibly colonizing other organs, the placenta and the foetus. The development of anuria is a sign of acute kidney failure. Resuscitation and effective antibiotherapy must be implemented.

Malaria

Complications may affect the foetus, leading to premature delivery (infection accompanied by uterine contractions), but also, infection of the foetus and placenta may cause intrauterine death.

In case of any "common" urinary infection or suspected infection antibiotherapy should be given immediately.

Two million people die of malaria each year, around the world, and many pregnant women are counted among these, of course. Women living in areas where *Plasmodium falciparum* is endemic have been exposed to repeated infestations during their childhood, and have developed a state of immunity against severe parasitaemia and pernicious attacks. This immunity is fragile, however. A woman travelling from an area where endemia is low to a highly pandemic area will only be slightly immunized. During pregnancy, women partially lose their immunity, for reasons that are not well understood : they are more often and more severely infested than other women living in the same environment.

In expectant mothers, the consequences are anaemia induced by malarial haemolysis, which compounds any existing iron-deficiency and folate-deficiency anaemia, as well as splenomegalia, sub-icterus and bouts of fever.

Pernicious attacks are rare, and maternal mortality is low in areas where malaria is stable. In certain tropical Latin American and Asian countries where malaria is unstable, adults are not as immune, and MM is high.

In pandemic areas, the consequences for the foetus are rarely miscarriage or still-birth, but on the other hand, foetal hypotrophy (low birth weight) is observed.

The usual treatment is chloroquine (nivaquine) : it is danger-free (neither teratogenic (1) nor abortive), but resistance has become a problem in South-east Asia, Latin America, eastern and central Africa. Quinine, useful for the treatment of pernicious attacks, is well tolerated, although it may cause hypoglycaemia. The risk of contractions or miscarriage is slight. Preventive or curative treatment with Lariam is active on chloroquine-resistant strains, but it is expensive. Its tolerance during pregnancy is not known.

For prevention, routine administration of nivaquine to all pregnant women is advised.

Tuberculosis

Its frequency varies with the prevalence of tuberculosis within the population ; contributing factors are poverty, malnutrition, excessive work load. Screening for tuberculosis should be done routinely in any case of prolonged coughing that is not cured by the antibiotics that are usually effective against bacterial lung conditions. When tuberculosis is treated during pregnancy the prognosis is excellent.

Diagnosis is based on :

- intradermoreaction (IDR) : this test is reliable during pregnancy ;
- gastric tubage to detect tubercle bacilli ;

(1) *Teratogenic* : producing malformations or foetal death.

- lung x-ray in case of recent positivation of the IDR or clinical signs suggestive of tuberculosis. It should be avoided during the first three months of pregnancy, because of a risk of irradiation of the foetus.

Active tuberculosis should be treated by known drugs of proved efficiency, such as Isoniazid (INH), Rifampicin or Ethambutol.

In infants born to tubercular mothers, the BCG or INH should be administered, since there is a 50 % risk of occurrence of tuberculosis during the first year of life.

PREVENTIVE ACTION

Iron supplementation

Since iron-deficiency anaemia is a major public health problem, especially in developing countries, and since pregnant women, whose requirements are particularly high, constitute the main risk group for iron deficiency, these women should systematically receive supplementation. To achieve this, it seems to be a good idea to distribute iron tablets to patients, for a one-month period, for instance : this may make the antenatal consultation more attractive, as well (1). Ideally, measures affecting all women of childbearing age should be envisioned, so that they may be in the best possible position to cope with any pregnancy.

Immunization

Immunization : as advised by who, vaccination against tetanus (ATV) should be ensured.

Dose	When to administer ATV	% of Protection	Length of protection
ATV-1	From first contact or as soon as possible during pregnancy	None	None
ATV-2	At least 4 weeks after ATV-1	80	3 years
ATV-3	At least 6 months after ATV-2 or during subsequent pregnancy	95	5 years
ATV-4	At least 1 year after ATV-3 or during subsequent pregnancy	99	10 years
ATV-5	At least 1 year after ATV-4 or during subsequent pregnancy	99	Life

Administration of Nivaquine

Given the risk run by both mother and child, routine distribution of nivaquine to all expectant mothers in endemic areas is indispensable.

EDUCATION FOR HEALTH

While waiting for their turn at the ANC -and every attempt should be made to reduce these waits by improving organization- pregnant women may participate in education for health activities either collectively or by one-to-one talks.

Such talks may deal with :

- the expectant mother's diet, behaviour and traditions ;
- breast-feeding, how to manage it, and what to feed small children ;
- hygiene during pregnancy and pathological conditions : bleeding, regardless of the extent, loss or suspected loss of amniotic

(1) S. HERCBERG, *Iron and folate deficiency anaemias*. In : *Children in the Tropics*. International Children's Centre, Paris, 1990, n° 186, 40 p.

fluid, fever, vaginal discharge and burning sensation, burning during micturition, uterine contractions before term and disappearance of foetal movements are all signs for which the woman should consult ;

- attendance of delivery by a trained worker ;
- those traditional practices and beliefs which are dangerous for the health of mother and child ;
- planned parenthood.

DATA COLLECTION

Data collection, using the antenatal consultation register, is necessary in order to :

- determine the risk factors for a given population group ;
- follow the evolution of pathology and of risk factors over a period of time (yearly reports) ;
- study the number and quality of referrals, as well as their evolution over time ;
- evaluate the action of trained traditional birth attendants who work in collaboration with the antenatal consultation ;
- evaluate the percentage of women receiving antenatal care and the evolution of this figure ;
- determine the impact of advice given during the consultation : how many women accept to give birth at the maternity, for instance ;
- make a yearly evaluation of the antenatal consultation's material and personnel needs.

In other words, no serious planning work with respect to the control of maternal mortality can be accomplished without the support of data collected during antenatal consultations. These must be accurate, simple and obvious to collect by the staff of the antenatal consultation. They may be completed by a limited study, if a question requires further investigation.

While the personnel working at the antenatal consultation must communicate reports to the upper echelon, they are entitled, in turn, to expect information on the analysis of these data, and possibly on their comparison with findings from other antenatal consultation units (from all over the country, for instance), as well as guidelines for the improvement of results. Without such information, the personnel may have the feeling, and sometimes rightfully so, that they are isolated, and that precisely those people who are in charge of training and supervising them lack interest in their task. The same is true for patients seen at the antenatal consultation and referred to a maternity unit for a pathological condition or preventively, for delivery. For such cases a report should always be returned to the peripheral unit so that the agent in charge may evaluate his or her decision and its efficacy. This relationship between antenatal consultations and referral centres is a vital part of training.

ORGANIZATION OF THE ANC

TASKS

The tasks of each member of the team must be clearly defined. A shortage of physicians, and of obstetricians in particular, explains the fact that ANC have long been run by midwives and/or nurses with training in obstetrics (sometimes called nurse-midwives). Questioning on the patient's medical history, based on her life story, should be thorough and performed by a trained individual who is capable of understanding which elements of the data collected are important for the estimation of risk.

Certain simple procedures may perfectly well be performed by workers who have not received extensive training. These include measuring height and weight, distributing iron and nivaquine tablets, and vaccination against tetanus.

Routine clinical examination should be performed by competent, experienced and conscientious workers, and includes the colour of the conjunctiva, blood pressure, uterine height, foetal heart sounds, presentation, inspection for oedema, cervical and pelvic examination.

At the end of this complete examination, the various pieces of information are analysed and conclusions drawn, with a view to decision-making. When necessary, questioning of the patient may be resumed, since women often find it difficult to furnish details on noteworthy events.

At this point, there are two alternatives :

- examination results are normal, there are no risk factors, and confinement at the clinic or rural maternity will be advised ;
- examination results are abnormal and/or there is a risk factor. In this case the patient is either referred to a physician, sent to a referral centre, or strongly advised to give birth at the referral centre. It may be valuable to explain the situation in the presence of the husband or of some member of the family, so as to convince them.

As a result of this type of organization, the physician or head midwife is only consulted for "at-risk" patients, and this leaves them with time for other surgical, obstetrical, administrative or training activities.

The systematically trained, supervised ANC personnel works in close collaboration with the staff of the referral maternity unit.

FACILITIES AND EQUIPMENT

The facilities should be quite simple, composed of a waiting-room - a porch roof offering shelter from the sun and rain, for example - an office containing a box for filing ANC cards, a scale and a measuring rod, and last, an examining room with a table (gynaecological, if possible), proper lighting, a tape measure, a Pinard's stethoscope, a cuff for taking blood pressure, sterile gloves or finger-tails, and speculums. It is preferable that it be equipped to do testing for urinary albumin (proteins), blood count or haemoglobin concentration, blood group with rhesus, urinary cytobacteriological + vaginal scrape examination and thick drop.

MEANS OF EVACUATION

The objective of mobile antenatal consultations is to enable women in isolated villages to attend the ANC. The number of tours will depend on the geographic distribution of the population, the objective being a minimum of one antenatal visit per pregnancy for every woman. The calendar for stops should be set in advance, in agreement with the population involved, so that people may come at the assigned time and place, which should be strictly respected. The mobile ANC may in fact be linked up with other mobile consultations, so as to reduce expenses, and transportation in particular, to a minimum.

The same equipment is required as for consultations in fixed units.

If the antenatal consultation is in the vicinity of a rural hospital possessing a vehicle for emergency transfer, or if a vehicle may be requested from the referral centre by telephone or radio, no major problem is involved in evacuating a pregnant woman to a maternity unit. The personnel should take the duration of travel into account in its decisions : the longer this lapse of time, the earlier the decision must be made. Often, however, it is up to the family to find and finance a means of transportation, and this may delay or prevent transfer. To ease this difficulty, at least partially, some governments have passed laws authorizing the requisition of any locally available means of private transportation such as a merchant's car, a truck, taxi, etc., for emergency medical evacuation. Unfortunately, too many patients are obliged to travel to the nearest referral centre on foot or by some inappropriate mode of transportation (cart, oxcart, etc.). This often worsens an already precarious state of health, but also causes many deaths. Once again, the importance of detecting all risks during antenatal consultations should be underlined.

REFERRAL CENTRES : THE MATERNITY UNIT

Maternal mortality and morbidity (including urinary incontinence, sterility, prolapse...) decline in countries as the number of deliveries attended by competent personnel rises. It is feasible, then, to improve the safety of home confinements, but only if all women are given access, during pregnancy and childbirth, to competent services. These are : maternities and obstetrical referral centres. This is well illustrated by Ricardo Schwartz (1), who shows the close link between maternal mortality and institutional coverage of delivery ; that is, the number of deliveries taking place in medical-surgical centres. When the rate of delivery in maternities nears 100 %, maternal mortality drops below 100 per 100,000.

Maternity units are rare in developing countries. They are located at one end of the chain composed by antenatal consultation centres. With the organization of a guidance-referral system, every agent can and should refer patients with pathological conditions to structures that are competent and equipped to treat them (figure 15).

TASKS

Rural hospital

Rural hospitals should be in a position to respond to a certain number of needs :

- monitoring of normal deliveries, with the help of a partogramme ;
- performing vacuum extractions ;
- performing controlled delivery of the placenta (routine uterine massage and use of oxytocics), artificial delivery of the placenta or uterine inspection ;
- making sure that antibiotics are adequately utilized ;
- care for the neonate ;
- performing curettage to ensure emptying of the uterus ;
- encouraging birth control practices and supervision of planned parenthood programmes.

All of these tasks should be performed by trained workers, but do not require the presence of a doctor. The future is in the performing of caesarean sections or symphysiotomies in rural hospitals, so that each and every woman may be offered the benefits of the best possible technical skills. Nurses or midwives may be trained in these techniques.

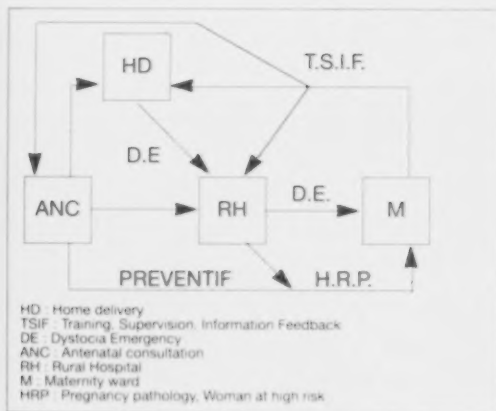


Figure 15 - The guidance-referral system

(1) R. SCHWARTZ, *Mortalidad materna y cobertura institucional para el parto*, 22 países de la Región las Americas 1973-84, WHO-FHE, 85, 1.2, CLAP-OPS WHO.

Maternity

In maternity units, the personnel is in charge of curative and preventive care, education for health, the training of health workers and data collection.

Needs with respect to curative care may be estimated by determining the percentage of high-risk pregnancies. This may be done by a retrospective survey ; that is, one that studies the records for deliveries over earlier months or years, or by a prospective survey collecting data over a given period, for the entire population affected by antenatal consultations and by all existing health structures.

This may be a case-control survey, for instance : each record of a maternal death is reexamined, to trace the history of the deceased patient, her socioeconomic characteristics, the course of her pregnancy and delivery. For each record of a death, one or several records of women who gave birth at the same place will be chosen at random or according to a preestablished rule. The history of these patients is also studied in detail, using the same method. This statistical technique makes it possible to accurately compare a population of birthed, deceased women and another group of birthed, live women, so as to determine the specific characteristics of those who died, using only a small number of cases.

The evaluation of a maternity's work load may be calculated using a simple formula recommended by WHO : supposing there is one maternity per 100,000 inhabitants, a birth rate of 40 per thousand, or 4,000 deliveries annually. An estimated 5 % of these deliveries will require the help of skilled personnel (200 deliveries), including one half for caesarean sections (100 caesareans, or about 2 a week).

Curative care given in referral centres has been classed by WHO in a document entitled "Essential Obstetric Functions at First Referral Level" (1986).

Surgical acts

Surgical acts include :

- caesarean section ;
- surgical treatment of severe sepsis ;
- repair of high vaginal and cervical tears ;
- laparotomy for repair of uterine rupture. Restorative surgery, haemostatic hysterectomy, ligation of the vascular pedicles ;
- removal of ectopic pregnancy ;
- evacuation of the uterus following in incomplete abortion ;
- use of oxytocin by intravenous infusion for augmentation of labour ;
- amniotomy ;
- symphysiotomy.

Anaesthesia

Anaesthesia may be divided into general anaesthesia and spinal anaesthesia.

Medical treatment

Referral centres must provide the following medical treatment :

- management of shock ;
- intravenous total dose infusion of iron ;

- management of uncomplicated sepsis ;
- management of hypertensive disorders of pregnancy.

Transfusions

To make transfusions possible, they must be able to determine the blood group and to perform cross-matching for compatibility.

Manual act

Manual and/or assessment functions include removal of the placenta (AD), inspection of the uterus, obstetrical use of vacuum extractors or forceps, and of the partograph.

Neonatal care

For neonatal special care, these centres must be able to perform resuscitation, prevention of hypothermia, feeding, and prior to this, foetal monitoring during labour.

The present publication has no pretention of being a manual of obstetrics ; it simply wishes to emphasize certain particularly important points.

THE PARTOGRAPH

Its establishment and routine use on the labour ward indubitably represent a major advance in obstetrics. Indeed, it is only through proper monitoring of delivery that anomalies requiring specific action on the part of the maternity staff may be detected in time (figures 16 and 17).

It is a fact that any prolonged, dystocic delivery caused by foeto-pelvic disproportion may have serious consequences (uterine rupture, foetal death...). Postpartum haemorrhage and infection, which are major causes of maternal mortality, are often due to prolonged labour (see figure 3).

Cervical dilatation

The central element in the partograph is a chart showing the progression of cervical dilatation, as ascertained by manual vaginal examination. This is based on knowledge of the physiology of labour. Figure 18 shows the different phases of labour. This chart indicates cervical dilatation with respect to duration of labour, in hours. It clearly shows a latency phase of dilatation, up to 3 cm, a peak phase between 4 and 9 cm, followed by a slower phase ending in complete dilatation.

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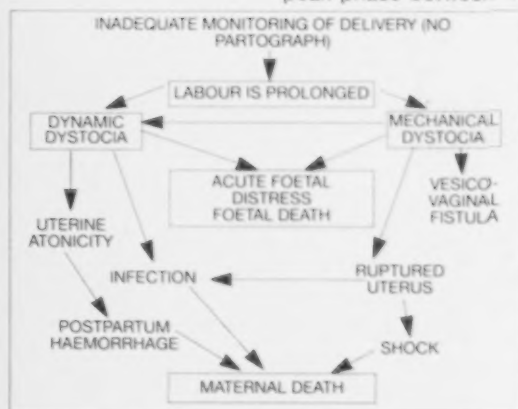


Figure 16 - Inadequate monitoring of delivery

In addition to showing the progress of dilatation, the partograph shows all necessary information on labour and delivery on a single sheet of paper :

- progression of the foetal presentation, which may be assessed by abdominal palpation and vaginal examination ;
- uterine contractions : frequency per 10 min., duration, relaxation (the physiology of uterine contraction is reviewed in the paragraph on uterine rupture) ;
- foetal status : foetal heart rate, colour of amniotic fluid, moulding of skull ;
- mother's state ;
- any treatment.

PARTOGRAPH

Name Pregnancies Parity Hospital No.
 Date of admission Time at admission Ruptured membranes o'clock

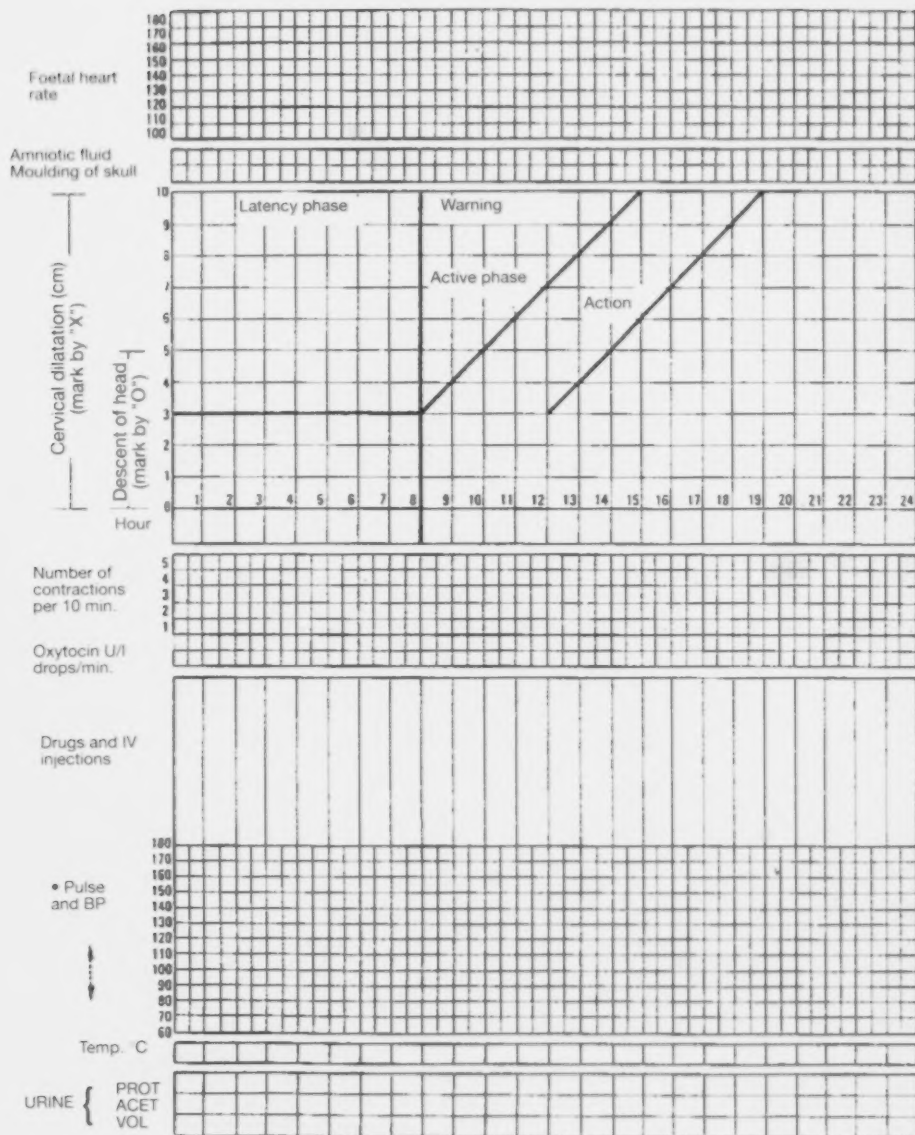


Figure 17 - The partograph

CAESAREAN SECTIONS

Indications :

A chart is included, on which cervical dilatation and progression of the presentation are recorded. This is completed by two parallel lines : the alarm line and the action line. When the curve of cervical dilatation crosses the alarm line, or if the latency phase (between 0 and 3 cm) lasts more than 8 hours, the patient must be transferred to a referral centre. If she is already there, monitoring should be reinforced. When the dilatation curve crosses the action line, labour must either be hastened (amniotomy, infusion of syntocinon), or terminated. This is therefore a decision-making aid.

Use of the partograph should be gradually extended to all health structures receiving women in labour. A manual for use of the partograph (WHO/MCH/88.4) was published by WHO in 1988.

Along with the screening of risks at antenatal consultations, the use of partographs for monitoring labour is indeed the best guarantee of proper referral practices, making medical or surgical action possible before the risk of maternal and foetal death is too high. In Yaoundé, Cameroon, Nasah and Léké have clearly demonstrated the link between the percentage of normal deliveries and the findings generated by the partograph (figure 19).

This is a major obstetrical act, since it saves many lives. Elective caesarean section should be performed preventively in case of :

- previous caesarean for foeto-pelvic disproportion ;
- 2 or more previous caesarean sections ;
- previous classical caesarean section ;
- certain breech presentations ;

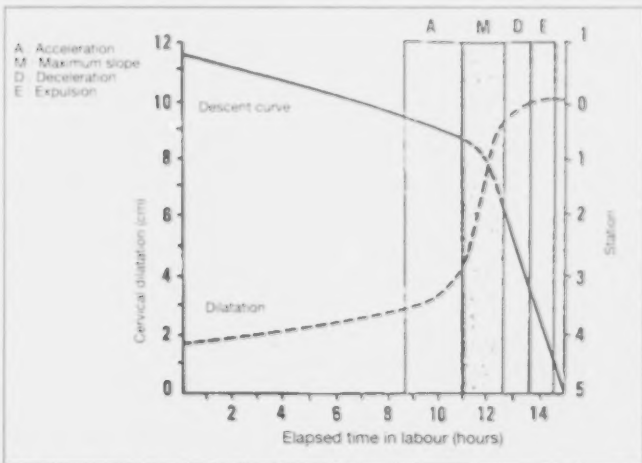


Figure 18 - The phases of labour

Taken from : FRIEDMAN and SATCHLEBEN. In : J. LANSAC, C. BERGER and G. MAGNIN. *Obstétrique pour le praticien*, Villeurbanne, SIMEP, 1983.

- placenta praevia ;
- foeto-pelvic disproportion ;
- induction impossible and delivery urgent : severely retarded growth, maternal hypertension... ;
- previous myomectomy ;
- fibroma of the isthmus ;
- post-surgical sepsis following previous caesarean section ;
- history of vesico-vaginal fistula ;
- extensive sexual mutilation.

It may be decided at the last minute in case of :

- procidence of the cord (live baby) ;
- transverse lie ;
- haemorrhage ;
- acute foetal suffering ;
- foeto-pelvic disproportion : failure of trial labour ;
- dilatation dystocia.

Caesarean sections should be performed by experienced personnel (obstetrician, general practitioner, medical assistant, midwife), under general anaesthesia with systematic intubation, or under spinal anaesthesia (following circulatory volume replacement) (see

appendix 5).

These two situations are entirely different. When performed in time (partograph and properly functioning referral), and before the occurrence of intrauterine foetal suffering, indicative of serious pathology, caesarean section is not a source of serious risk. In contrast, the risk is very great when it is performed at the last minute on an exhausted, anaemic, dehydrated woman, often in the presence of infection. In Libreville, Gabon, for instance, mortality subsequent to caesarean section is 10 times higher than after vaginal delivery (7.3/1,000 as against 0.7/1,000) (1). In Nigeria, Ojo et al find a maternal mortality rate of

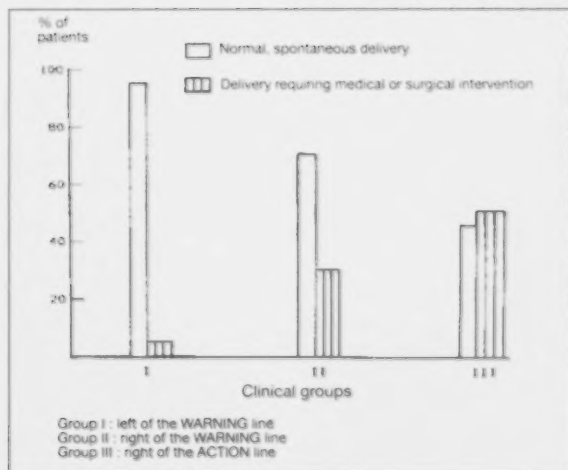


Figure 19 - Relations between normal spontaneous deliveries and those requiring medical or surgical intervention, for each clinically defined group.

Taken from : NASAH and LEKE, Yaoundé, Cameroon.

(1) BOISSELIER, PIGNE, JOUHET et al, L'hystérectomie d'hémostase en obstétrique. In : J. Gyn. Obst. Biol. Reprod. 1989, 18, pp. 445-450.

18.1/1,000 following caesarean section, as opposed to 1.9/1,000 in vaginal deliveries. 81% of deaths consecutive to caesareans are caused by infection (1).

Hysterotomy should be segmental and generally transverse.

Vertical lower segment hysterotomy requires greater vesical separation, with a risk of injury at the bladder level, with the wound possibly extending downward to the cervix when the child is extracted (suture is then difficult), or upward into the body. It is still indicated in case of uterine retraction, transverse lie or caesarean section on an early pregnancy, when the lower segment is insufficiently developed and narrow. Transverse lower segment hysterotomy should therefore be preferred, since vesical separation is limited, suturing is easier and the incision remains strictly segmental. A slightly arched incision partially prevents accidental extension to the lateral uterine pedicles.

Classical hysterotomy is no longer practiced, since the quality of the healing process is poor, resulting in a high risk of uterine rupture during subsequent pregnancies. It is only indicated in one case : in repeated caesarean sections, when intra-abdominal adhesions prevent access to the lower segment, and when surgery is followed by tubal ligation.

Suture of the uterine incision is performed on an extramucosal plane by an X-stitch at each angle, and simple stitching in-between, using resorbable thread (chromed catgut, resorbable braided thread).

These include :

- injury of a branch of the uterine artery, by accidental lateral extension of the hysterotomy : this must be located and clamped, using a long clamp of the bengolea type, followed by an X-stitch. Exteriorization of the uterus may improve visibility and safety in the conduct of this operation ;
- haemorrhaging of the parametrium : the latter is delicately dissected, to locate the injured vessel and ligate it (in case of failure, compression using resorbable plugs) ;
- haemorrhage due to placenta praevia. The lower segment is damaged and does not retract. Tamponade and intramural oxytocics generally suffice (10 IU of oxytocin injected in the uterine muscle) ;
- haemorrhage due to placenta accreta. Delivery of the placenta must be as perfect as possible, and too much scraping of the uterine muscle avoided, given the risk of perforation. Intrauterine tamponade and an intramural oxytocic are required ;
- uterine infarction in case of retroplacental haematoma : an observation period should always be respected, in case the ute-

Complications

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(1) OJO, ADETORO, OKWEREKWU. Characteristics of maternal deaths following cesarean section in a developing country. In : *Int. J. Gyn. Obst.* 1988, 27, pp 171-176.

rine resumes its colouration, before a hysterectomy is decided. Transfusion of fresh blood may combat coagulation disorders.

Treatment of complications involves haemostatic hysterectomy or vascular ligation, and blood transfusion.

Before deciding a haemostatic hysterectomy its indication should be carefully weighed, since this is a difficult operation causing profuse bleeding. It involves the following phases :

- ligation and sectioning of the round ligaments ;
- haemostatic sectioning of the utero-ovarian ligaments : this is very delicate, owing to the high risk of haemorrhage. During pregnancy, the utero-ovarian ligament is short and highly vascularized. Haematoma of the broad ligament increases the difficulty. The tissue is easily abraded and may be cut by the threads ;
- dissection of the broad ligament and section-ligation of the uterine pedicles, bearing in mind the fact that the ureters are very close to the uterine pedicles as long as the cervix is somewhat dilated ;
- sub-total hysterectomy, continuing section of the lower segment on the lateral and posterior sides. Total hysterectomy should only be visualized in dire cases, to stop haemorrhaging of the lower part of the lower segment and of the cervix. There is a high risk of injury to the urinary system (bladder, ureter) ;
- peritoneoplasty and drainage.

To avoid hysterectomy, post-caesarean haemorrhage may be stopped by ligation of the two uterine arteries (Waters, 1952) or of the three uterine pedicles : the round ligaments, the uterine arteries and the utero-ovarian pedicles (1). Subsequent pregnancies are possible after such operations because of the extremely rich vascular anastomosis in the pelvic region.

Other specialists prefer ligation of the hypogastric artery -the internal iliac artery- which is the main pelvic artery and branches into the uterine artery (2).

Coagulation disorders may be a contraindication for hysterectomy, and cause arterial ligations to be ineffective.

Blood transfusion is frequently indispensable in the course of a caesarean section, particularly when it is an emergency operation, and when complications -haemorrhage, infection, coagulation disorders- develop.

(1) M.S. TSITULNIKOV, *La ligature des vaisseaux utérins au cours d'une hémorragie obstétricale*. In : J. Gyn. Obst. Biol. Reprod. 1979, 8, pp. 751-753.

(2) SALVAT et al, *Indications et techniques de la ligature des artères hypogastriques dans les grandes hémorragies obstétricales*. In : Rev. Franç. Gyn. Obst. 1981, 76, n° 2, pp. 97-106.

The alternatives

International manipulation

Whenever caesarean section is considered highly risky for the mother's health, it should be replaced by other manipulations, when possible.

One of these is version by internal manipulation (VIM), which consists in a change of polarity transforming a non-engaged head presentation into a breech presentation, following which breech extraction is performed (version-breech extraction). Extraction of a foetus in a transverse lie can only be done once the membranes are ruptured and the cervix is dilated, and then only when a caesarean section may be performed in case of complication. The uterus should always be inspected afterward, to eliminate the risk of uterine rupture. This version by intrauterine manipulation is contraindicated in case of a neglected shoulder presentation with proclivity of the arm, or of rupture of the membranes more than one hour earlier, since the uterus then retracts around the foetus, and rupture is unavoidable. Antibiotherapy should be administered systematically, as in every intrauterine manipulation (1).

Partial subcutaneous symphysiotomy

Partial subcutaneous symphysiotomy (2) is an act which should be rehabilitated and taught, although it does have some opponents. The value of this operation resides in its rapidity and ease of performance by trained workers, making it possible to avoid a caesarean in some cases, and to hasten expulsion of the child. When properly done and followed by some postpartum precautions, this operation has relatively few disabling effects on the patient, and in those regions where it is practiced, it is not uncommon to observe repeated symphysiotomies when the first did not put an end to the problem of a contracted pelvis.

Briefly, this operation is performed on a woman in the obstetrical position (knees drawn up on the abdomen), under local anaesthesia and using a lancet. The symphyseal cartilage is cut, along with the arcuate ligament (lower symphyseal ligament), while the superior symphyseal ligament formed by the insertion of the abdominal muscles is spared. A urinary probe is used to locate the ureter correctly so that it may be pushed aside and injury avoided while the cutting is being done. A separation two fingers wide is obtained; this increases the pelvic surface, by increasing the diameters, eases movements of the articulations and head movements, all of which facilitate delivery.

Symphysiotomy is indicated in foeto-pelvic disproportion, brow or face mentoposterior presentations, breech presentations with head last and ritual excision, as well as when caesarean section is dangerous for the mother.

(1) PERRIN, ATCHADE, ALIHONOU, La version par manoeuvre interne : alternative à une opération césarienne dans des conditions précaires. In : *Rev. Fr. Gyn. Obst.* 1987, 82, 4, pp. 247-250.

(2) E. ZARATE, Symphysiotomie partielle sous-cutanée. T.I.C.A. BP 4166 - Buenos Aires - Argentina. This technique is also discussed in "La Maternité". COURTJOIE, Zaïre.

RUPTURE OF THE UTERUS

Torn cervix

It has many advantages : absence of general anaesthesia, strictly subcutaneous operation, lack of uterine scar. It may definitively end contracted pelvis problems.

During the postpartum period, the patient must be prevented from spreading her legs for one week -they may be loosely tied together- or from sitting up during the first 24 hours. At the end of one week she may stand up. Some practitioners place a large bandaid at the trochanter level, while an aide presses down on the antero-superior ilial spines ; this is left in place for one week. At first the women will walk with the help of a stick. Sequelar pains may persist for several weeks.

Complications are essentially urinary, and the technique must be properly learned and performed, to avoid these.

The aim of embryotomy is the extraction of a dead foetus following reduction of its diameters. Such operations are performed sight unseen, and are extremely dangerous for the mother. Caution and experience are required.

A distinction must be made between a torn cervix and rupture of the uterine body.

This may occur spontaneously on a healthy cervix as a result of cervical oedema during prolonged labour. It is usually induced by encouraging the woman to push too soon. It may be produced by the use of forceps, or by a head last extraction before complete dilatation. Occasionally incision of the cervix -a dangerous act, to be proscribed- may cause tearing to extend to the uterine body.

The cervix should be examined, using vaginal valves, in case of any postpartum haemorrhage.

Tears are classed as subvaginal (the top of the tear is visible, below the vaginal cavity), and supravaginal, which extend to the lower segment, to become uterine ruptures.

Prevention involves waiting for complete dilatation before asking the woman to push or introducing forceps, and never incising the cervix.

Cervical exploration should be performed routinely following any forceps extraction, difficult delivery or intrauterine manipulation.

Subvaginal tears are usually benign, and bleeding stops spontaneously. If not, suture should be done following proper exposure of the lesion (using traction clamps and vaginal valves) : it should always begin at the upper end.

The prognosis is more reserved in supravaginal tears, and laparotomy may be required in case of intractable bleeding.

Rupture of the uterine body (1) usually occurs in a healthy uterus, because of poor monitoring of delivery. The extent of infection is

Uterine body

(1) E. NICOLOSO, *Les ruptures utérines en Afrique. Thésis, Bordeaux II, 1984, 287.*

proportionate to the duration of labour, and to the multiplication of septic obstetrical manipulations.

It should be remembered that the uterus is a muscle composed of smooth fibres whose contraction is involuntary. This muscle is sheathed in a serous membrane, the peritoneum, and internally lined with a mucous membrane in which the placenta is inserted. The muscle itself is composed of three layers, an external layer of circular fibres reinforced by longitudinal bundles, a median layer in which the muscle fibres are intercrossed, and which contains the blood vessels, and last, an internal circular layer.

During pregnancy, the muscular fibres are hypertrophied, so that the uterus may grow, and a third part known as the lower segment then develops between the uterine body and the cervix. The lower segment is very thin-walled (2 to 4 mm) and covers the presentation. A thin lower segment is a positive prognostic element for delivery. It contains few muscle fibres and plays a major role in cervical dilatation. It is almost always at this level that uterine rupture occurs.

The peritoneum adheres closely to the muscle on the uterine body. When the rupture is at that level -between the muscle and the peritoneum- it is often complete, and places the uterine cavity in direct contact with the abdominal cavity. Infection may then spread rapidly. At the lower segment level, on the other hand, the peritoneum does not adhere to the muscle. The rupture may be incomplete here : the muscle is torn, but the undamaged peritoneum protects the abdominal cavity. A subperitoneal haematoma may then develop.

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Uterine contractions are involuntary : the woman experiences them passively. They are intermittent and rhythmic : they last from 30 to 90 seconds, with a 1 to 3-minute period of rest between them. Contractions are total ; that is to say, they involve the entire uterus, which is hard, to the touch. They are painful, as well : the pain increases as labour progresses. The feeling of pain varies from one patient to another, and is increased by anxiety while it is diminished, or more satisfactorily controlled, when the patient is calm and reassured by the attitude of the personnel and the atmosphere in the delivery room.

If an obstacle is encountered, such as a narrow pelvis that prevents the presentation from progressing, the uterus struggles against the obstacle by increasingly strong contractions at shorter intervals (abnormally increased frequency and intensity of mobility, or hyperkinesia). The muscle suffers, owing to cellular anoxia, and oedema develops. This muscular suffering is conducive to infection. Such abnormal contractions usually precede rupture of the uterus.

Normal labour lasts an average of 12 hours in primiparas and 6 hours in multiparas. When labour is prolonged (18 hours or more), the muscle suffers and is fragilized.

CIRCUMSTANCES SURROUNDING RUPTURE : DYSTOCIA

Rupture of the uterus occurs in case of dystocia, or obstructed delivery, the causes of which include anomalies affecting the uterine motor, the pelvic structure or the foetal presentation.

A distinction is made between :

Dynamic dystocia

- dynamic dystocia, or abnormal uterine contraction or cervical dilatation. Treatment is based on oxytocics. In older, grand multipara women, the uterus is tired, does not contract properly, and labour does not progress. Oxytocics are contraindicated here ;

Mechanical dystocia

- mechanical dystocia : this is either of skeletal origin -one of the most frequent causes of uterine rupture in developing countries, where adolescent girls may have a contracted pelvis as a result of childhood malnutrition, poliomyelitis or osteomalacia- or of foetal origin : large foetus, dystocic presentation (transverse lie, brow, mentoposterior face). Last, delivery may be hindered (or made impossible) by a pelvic tumour (fibroma), a vaginal anomaly or cicatricial bridling of the vagina and vulva in case of tearing during a previous delivery or ritual excision.

Uterine rupture is favoured by :

- any uterine scar, but more specially corporeal scars, which are much less resistant and should be rejected (classical caesarean section, myomectomy) ;

- abuse of oxytocics, administered at excessively high doses, intramuscularly or in unrecognized dystocia ;

- obstetrical manipulations (VIM, forceps, uterine expression with pressure too great or prolonged).

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Location of the rupture

Anatomically, the rupture may be located on the body, the lower segment, or both, on the anterior wall or on one of the lateral walls (usually on the left, and in the latter case bleeding is more profuse owing to the proximity of the lateral venous plexuses).

Clinically, the rupture occurs during labour, but may be discovered during the postpartum period, during inspection of the uterus or laparotomy consecutive to postpartum abdominal complications.

It should be recalled that the uterus should be systematically inspected and emptied, under aseptic conditions, following :

- long, arduous labour ;

- difficult instrumental extraction ;

- version by internal manipulation ;

- postpartum shock.

CONSEQUENCES AND TREATMENT

Shock

The consequences of rupture are shock and infection. Shock is immediate, first caused by the pain, then by haemorrhaging of the torn uterine wall, placenta and uterine venous plexuses. Bleeding is soon compounded by coagulation disorders. Shock is particularly poorly tolerated when the patient is exhausted by prolonged labour, undernourishment and anaemia, and has experienced a difficult expulsion.

Infection

Infection sets in rapidly. The ischemic uterus can no longer defend itself and its contents (the dead foetus) are septic. If the patient does not die of haemorrhage, she is often the victim of lethal septicæmia. This infection often requires that hysterectomy be performed for the sake of cleanliness.

Shock should be treated first (volume replacement, transfusion,...), after which early, massive IV antibiotherapy with penicillin, gentamycin and metromidazol is administered (see Appendix 5).

Surgical treatment of the rupture -laparotomy- involves suture of the tear if it is recent, not too long, clearcut and not infected ; in all other cases, hysterectomy and drainage are required.

Prevention

Prevention of uterine rupture is based on screening and routine referral of patients at risk of mechanical dystocia or with a scarred uterus. It is also facilitated by monitoring of deliveries in homes or rural hospitals, the prohibition of oxytocics for home deliveries and the utilization of partographs. Uterine inspection, when indicated, should not be overlooked. Tubal ligation is necessary after three or four caesarean sections (see figure 3).

PUERPERAL INFECTION

Infection is one of the three main causes of maternal deaths. It generally occurs during the puerperal period, and enters through the vagina and the placenta. Infection is transmitted by the entourage, health workers and other patients.

It was Semmelweis who, toward 1850 in Vienna -at a time when germs had not yet been discovered- was the first to realize that infections in women on maternity wards were caused by vaginal examinations performed by physicians who did not wash their hands beforehand. The notion of asepsis did not exist at the time, and puerperal infection was extremely lethal in Europe. In Paris, in 1856, Tarnier recorded one maternal death caused by puerperal fever for 17 deliveries. This infection is still extremely frequent and life-threatening in developing countries, whereas it has practically disappeared in industrialized countries, owing to the systematic application of the rules of asepsis, first, followed by antibiotherapy.

Puerperal infection is fostered by prolonged labour, early rupture of the foetal membranes (amniotic infection), haemorrhaging during pregnancy, labour or delivery of the placenta (causing anaemia), damaged or torn tissues in the maternal passages and more generally, anaemia, exhaustion and malnutrition.

The germ most frequently involved is the streptococcus. Puerperal infection may take a number of clinical forms :

- uterine infection (puerperal endometritis) : most often, a fever (38-39°) develops three or four days after delivery, lochia are foetid (the smell is unbearable) or purulent. The uterus is enlarged, soft and painful. At this stage, a short course of antibiotherapy puts an end to these signs ;
- the suppurating form, with uterine abscess, is more serious : there is intense fever and fatigue, and exquisite, precisely located pain at one point on the uterus corresponding to the abscess ;

- the putrid form, with an impression of uterine crepitation when touched, and extreme impairment of general health. This is even more serious ;

- haemorrhagic forms are not exceptional. They involve fever, pain and puerperal metrorrhagia.

Sepsis may extend to the tissues of the parametrium, located on the lateral walls of the uterus, causing a phlegmon of the broad ligament. Fever, fatigue and pain are associated with urinary (dysuria) and digestive signs. Palpation uncovers a hard, painful lateral thickening. Uterine mobilization is extremely painful.

Puerperal peritonitis is general peritonitis ; the patient is tired, her face is gray, she has pouches under her eyes. Her pulse is fast and thready, blood pressure is low. Temperature is variable, but this peritonitis is unusual in that vomiting occurs late, constipation is replaced by diarrhoea, abdominal defense is rare, usually accompanied by great abdominal distension. The prognosis is very poor.

Suppurated pelvic phlebitis is caused by infected blood clots located in the utero-ovarian or uterine veins, and moving to the lower vena cava. Systemic signs are serious : the patient has bouts of fever with intense, prolonged shivering (lasting 10 min to 1 hour), with trembling, facial cyanosis and anguish. Between the bouts, the greatly improved general state is deceptive. Palpation reveals the existence of pain on the venous path, from the horn of the uterus to the hypochondrium. There is an evolution toward death, with increasingly frequent bouts of fever and septic complications in other regions : the suppurating clots migrate toward the lungs.

Septicaemia may either set in immediately or following a local form ; infection spreads to the blood and becomes systemic. Repeated bouts of fever and shivering, followed by a steady, high fever (39-40°), accelerated pulse, baked tongue, shining eyes, scant, dark urine complete the picture. Haemoculture is positive (presence of streptococci). The outcome is most often death.

Prevention

The aseptic delivery

How can puerperal fever be avoided ? First, every attempt must be made by workers to make delivery aseptic : hands should be washed and scrubbed before performing vaginal examinations, and sterile gloves or fingerstalls used. The vulva should be washed with soap and water before delivery. Clean over-garments and linen should be available for workers, all instruments should be sterile and the facilities should be kept clean, and disinfected at regular intervals.

The control of labour

Labour should be carefully monitored, using a partograph. Screening and treatment of dystocia avoids prolonged labour, haemorrhage, prolonged rupture of the foetal membranes, amniotic infection, acute foetal suffering with foetal death during labour and, of course, rupture of the uterus. Caesarean sections should be performed before severe complications set in, and therefore in

the absence of infection. Prevention of puerperal fever also involves proper surveillance of the puerperium, as shown in figure 20.

Antibiotics should be administered systematically when labour is prolonged, when rupture of the foetal membranes occurred at home or several hours prior to delivery (risk of amniotic infection), in case of haemorrhage, intrauterine manipulation (AD, UR, version-breech extraction), cervical or vaginal tears. Foetal death during labour with ruptured membranes is always highly septic. Craniotomy (or embryotomy) presents an additional risk. Last, uterine rupture is always followed by extremely serious peritonitis. Caution should therefore be exercised, and in the author's opinion anaemia and maternal exhaustion (even when labour is not prolonged) are also indications for routine antibiotherapy begun at delivery. Large doses of antibiotics should be given, with intravenous infusion of those antibiotics that are active on anaerobic germs in severe cases.

Treatment involves early antibiotherapy and surgery : hysterectomy in some cases of uterine abscess or rupture, incision of an abscess in the true pelvis, vaginal drainage of a Douglas' abscess.

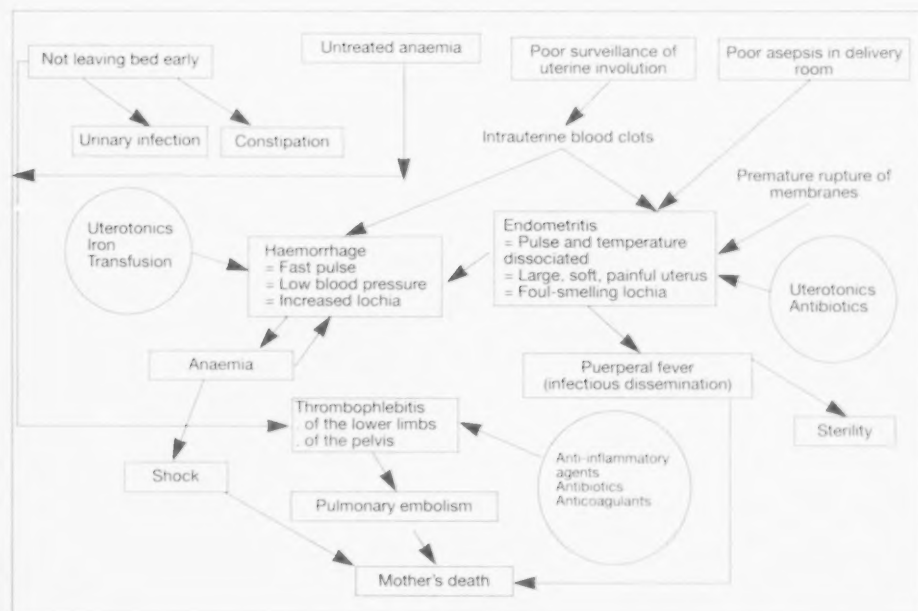


Figure 20 - Prevention of puerperal disorders

Taken from : L. DE BERNIS, *Prevention in Obstetrics*. In : *Children in the Tropics*, Paris, International Children's Centre, 1984, n° 152/153.

HYPERTENSION

Pregnancy toxemia

Hypertension may exist prior to pregnancy, and in that case it often increases. It may also develop during pregnancy; this is pregnancy toxemia, with two serious complications for both mother and child: eclampsia and retroplacental haematoma (RPH).

The physiopathology of pregnancy toxemia is not clearly established as yet. However, present-day therapeutic management is based on some well-defined notions. In the hypertense pregnant woman, the placental blood flow is decreased. The blood flow to the kidneys is 30 to 40 % below the normal level for pregnancy, and the kidneys are unable to adjust to the situation. One step further and renal failure occurs. The mechanism of proteinuria (urinary albumin) is not properly understood. Deepseated renal modifications occur, the mediators of which have not been identified. The usual reversion of such symptoms following delivery is an indication of their functional nature. Furthermore, during pregnancy toxemia, the circulating blood volume is lowered, and this hypovolaemia is damaging for the uteroplacental circulation. The usual reversion of such symptoms following delivery is an indication of their functional nature. Furthermore, during pregnancy toxemia, the circulating blood volume is lowered, and this hypovolaemia is damaging for the uteroplacental circulation. The hypercoagulability usually observed in normal pregnancy is aggravated here, and results in disseminated intravascular coagulation (DIC), which may lead to an haemorrhagic syndrome with major thrombopenia and a plunging fibrinogen concentration. So severe a picture is rare, but may be observed in eclampsia, and above all in retroplacental haematoma. Immunological hypotheses have been put forward in recent years to explain this process. It is a fact that pregnancy involves the acceptance, by the mother's organism, of a transplant containing foreign tissues, since the foetus possesses a number of the father's characteristics. This is an exciting new avenue of research.

Screening for hypertension, oedema and albuminuria is done at the antenatal consultation. The mean blood pressure figures for the overall population must be known, in order to determine a cut-off point at which blood pressure becomes pathological for that particular group.

The signs of heightened toxemia are sudden weight gain (change of slope in weight curve, due to oedema), headaches, visual impairment, epigastric pain immediately preceding the eclamptic seizure.

Management of pregnancy toxemia (preeclampsia, eclampsia) or of shock caused by retroplacental haematoma first involves medical resuscitation with the insertion of a peripheral and/or central venous catheter for "appropriate volume replacement". Shock should be treated by antihypertensive medication (bearing in mind the fact that hypotension is more harmful for the foetus than hypertension), anticonvulsive agents (Valium, magnesium sulfate, etc), fresh blood (same blood group, same rhesus), passage of a urinary probe to monitor diuresis, etc (see Appendix 5).

INDUCED ABORTION

The next decision involves obstetrical management, in view of the urgency of rapid emptying of the uterus, for the survival of both mother and child : this involves induction of expulsion by infusion of syntocinon, and amniotomy if the cervix is amenable, or caesarean section. In case of retroplacental haematoma ("wooden" uterus), artificial rupture of the foetal membranes -when possible- often facilitates the rapid expulsion of the foetus. Only after expulsion can diuretics be given.

Approximately 60 % of the world population lives in countries where abortion is prohibited by law. At the same time, illicit abortion is a major cause of maternal mortality. The abortion rate (frequency with respect to the female population) is high in countries where it is illegal, since it is often the only means of "contraception" available to women. However, accurate knowledge of this figure, and of the maternal mortality rate connected with it, cannot be obtained, since these do not appear in statistics : this makes them very difficult to study. Certain hospital surveys show figures for deaths caused by abortion complications, without specifying the proportion of illicit abortions. Some evaluations are possible, however. In Bangladesh, the Philippines and Venezuela, for instance, abortions account for approximately one fourth of maternal deaths (figures from WHO).

Legislative modifications pertaining to induced abortion provide some interesting information. Maternal mortality generally drops whenever abortion is legalized (even in a restricted form), and when appropriate structures are created. Conversely, when a more repressive law was passed in Rumania in 1966, in an attempt to increase the birth rate, maternal mortality increased.

Legal induced abortion is much less dangerous, since women who wish to abort may attend specialized units where technical prophylactic measures are taken.

Several studies show the high cost of abortion-related complications for health services. In those countries where induced abortion is illegal, it is not improbable that inequalities between socio-economic groups constitute a compounding factor for maternal mortality in the underprivileged strata.

Planned parenthood programmes may contribute to reducing the number of illicit abortions.

A great variety of techniques are used for illicit abortions : these range from the introduction of instruments into the uterus to the intrauterine injection of toxic substances including toxic plants and drugs considered to be abortive (strong doses of quinine, chloroquine).

Complications are as varied as the techniques used. They are haemorrhagic (incomplete abortion, cervicovaginal damage by a toxic product, coagulation disorders possibly causing death) and septic (endometritis, salpingitis, acute peritonitis owing to uterine perforation, Douglas' abscess, septicaemia, tetanus). They may also involve embolism (cerebral embolism following injection of

BLOOD TRANSFUSION

water or air into the uterus), ischemia (uterine infarction following injection of soap) or intoxication (damaged kidney or liver).

Treatment includes emptying of the uterus (using a blunt curette or aspiration), along with routine antibiotherapy (triple antibiotherapy) if any potentially dangerous manipulations were performed. If there is any suspicion of uterine perforation, if a severe state of shock or serious infection is observed, a laparotomy should be performed. Whenever possible a coelioscopy should be performed beforehand to determine the extent of the lesions.

Prevention is based on a national policy promoting planned parenthood and education for health.

Blood transfusion is a life-saving act in obstetrical practice. Experience in Zaria, Nigeria (1) shows that nearly 10 % of birthing women need a blood transfusion (4 % of women seen at antenatal consultations as against 20 % of emergency hospital admissions).

Two problems need still be solved, however : first, the risk of disease transmission through transfusion (HIV, hepatitis B, malaria, syphilis, trypanosomiasis, microfilariae, typhoid fever and brucellosis) and secondly, the difficulty and high cost of setting up a blood bank, and the cultural taboos linked to giving one's blood.

Practically speaking, it is mandatory for an obstetrics unit to possess a small reserve of blood, kept in a refrigerator and taken regularly from the family of operated patients, for example. Indications for blood transfusions should be given serious thought, and replaced by volume expanders or plasma, when possible. Donor-patient cross-matching tests will of course be performed systematically. Auto-transfusion may be performed in case of haemoperitoneum (ruptured extra-uterine pregnancy).

These are the curative tasks of an obstetrical referral centre.

But a maternity unit contains an antenatal consultation -possibly reserved for at-risk pregnancies- , a planned parenthood centre, and teaching facilities as well. This has been mentioned repeatedly in discussions on the training of traditional birth attendants and of personnel working in rural clinics and hospitals.

One important task for a referral centre is data collection. The information coming from different antenatal consultation sites and peripheral hospitals should converge there. This is the best way to obtain accurate figures for the maternal mortality rate and its main causes. Analysis of this data facilitates the elaboration of a coherent policy for combating maternal mortality.

Last, since all obstetrical emergencies in a region converge on the maternity unit or referral centre, it is important to provide feedback for workers involved in screening for risks and treating dystocic deliveries at the peripheral level.

For emergency evacuations, the referral centre may find it useful

(1) Kelsey A. HARRISON. *Child bearing, health and social priorities : a survey of 22,774 consecutive hospital births in Zaria, Northern Nigeria. In : British J. of Obst. and Gynaecol. 1985, Supplement n° 5, Oct.*

to set up a "maternity home". This is particularly justified when distances are great and/or means of transportation insufficient. This home is destined for high-risk expectant mothers, and especially those with a foreseeable need for a surgical technique, and who live in outlying or poorly served areas. The hospital should be in a position to provide a number of commodities, depending on its budgetary possibilities. Antenatal care should of course be continued there.

PLANNED PARENTHOOD

ITS IMPORTANCE

Too short a period between pregnancies (an interbirth interval of less than 2 years), too many pregnancies and undesired pregnancies are major factors in maternal mortality.

Aside from the legal issue (of women's right to determine how many children they want), which is in the hands of each government, the two aspects of planned parenthood - birth spacing and sterilization - are very much a part of the combat to reduce maternal mortality. To this should be added the question of excessively early pregnancies, which raise both the legal problem of the age at which marriage is authorized, and that of contraception for adolescent girls, which is a very ticklish issue. Table 7 shows the role of age and parity in maternal mortality. In itself, effective planned parenthood could result in a 1/3 drop in maternal mortality around the world (table 8).

Table 8 PLANNED PARENTHOOD

% OF WOMEN EXPOSED TO THE RISK OF AN UNDESIED PREGNANCY			
PAKISTAN 22 %	COLUMBIA 18 %	EGYPT 18 %	KENYA 8 %
% OF MATERNAL DEATHS AVOIDABLE BY PLANNED PARENTHOOD			
JAMAICA 44 %	COLUMBIA 39 %	EGYPT 28 %	KENYA 15 %
% OF MATERNAL DEATHS IMPUTABLE TO ILLICIT ABORTION			
ETHIOPIA 29 %	BANGLADESH 20 %	CHILE 64 %	RUMANIA 86 %

Source - WHO

In Cameroon, Nasah estimates that the risk of maternal death is multiplied by fifty in case of illicit abortion.

Planned parenthood raises a political issue (the existence or absence of legislation, restrictive legislation) and a cultural problem. It is a fact that the dissemination and success of contraceptive methods requires a change or an evolution in the mentality of couples everywhere. Here too, educational level and poverty play a considerable role, since women living under conditions where perinatal and infantile mortality are still dramatically high will find it particularly difficult to heed the advice of planned parenthood counsellors. The history of birth control does in fact show a correlation between a rising standard of living and an increased number of couples using a contraceptive method. Sterilization and birth control techniques will be succinctly described below. Appendix 4 contains a reminder of the female reproductive cycle.

STERILIZATION

Sterilization is applicable to both men and women. Male sterilization, or vasectomy, is a simple, rapid operation which may be performed under local anaesthesia. It involves the ligation of the deferent canals above each testicle. It is definitive. Vasectomy is globally much less widespread than female sterilization. This simply reflects the cultural problems tied to sterilization. At present, the country in which this technique is most widely used is India.

Female sterilization, or tubal ligation, involves the cutting or obturation of the fallopian tubes. This makes any meeting of ovocytes and spermatozoons definitively impossible. It may be performed either by coelioscopy (without abdominal incision), by mini-laparotomy or during a caesarean section.

The most frequently used technique is the mini-laparotomy (3 to 4 cm-long incision above the pubic symphysis).

Colpotomy, using Douglas' pouch as the surgical entrance, is a more delicate technique and requires experienced personnel. In certain countries such as Thailand, sterilization of women is done by midwives trained in these techniques (1).

Tubal ligation does not disturb women's physiological functions : ovulation and menstruation remain strictly unchanged. There is no absolute contraindication for voluntary sterilization in case of any medical problem. In severe forms of congenital (cyanotic) heart disease, for example, sterilization is less dangerous than pregnancy. There are some risks, however, and these are essentially linked with those inherent in anaesthesia and pelvic surgery (haemorrhage, infection). As in any sterilization technique, a searching interview with the couple is required, owing to the possibility of adverse psychological reactions in the woman following this operation. The risks involved, the procedure used and the consequences should be explained at that point. It is important that basic physiological information be provided, so that the couple may decide with full knowledge of the facts. The definitive character of the operation should also be emphasized, especially when there is a different prevailing cultural notion of time and projection into the future.

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CONTRACEPTION

ORAL CONTRACEPTION

Contraception may be oral or mechanical. Male contraception is presently in the research and experimental stages. An anticonceptual vaccine should theoretically be made available in 1995. It will act by neutralizing the chorionic gonadotropic hormone (CGH).

The contraceptive pill was first commercialized in the United States in 1956. Pills contain two hormones : a progestational hormone, or progesterone, which puts the ovary to rest, with no possibility of ovulation, by acting on the pituitary ovary-controlling function, and an oestrogen, which reinforces the effect of the progesterone and ensures proper nourishment of the endometrium.

(1) NIKORN DUSITSIN ; SUVANEE SATAYAPAN, Sterilization of women by nurse-midwives in Thailand. In : *World Health Forum*. 1984, 5, pp. 259-262.

NON ORAL CONTRACEPTION

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Very low-dose progesterone may also be administered alone (micro-pills) ; these act on the cervical glair. Last, oestrogen may be administered alone at high doses, then associated with progesterone for several days : this is the sequential method.

Both mini-pills and normally dosed pills should be recommended in first intention for women and adolescents with no hormonal dysfunctioning. The stronger pill will be preferred when there is a risk that it will not be taken punctually. The progesterone-only pill should be given in the presence of a fibroma that tends to bleed, or of breast pathology of the mastotic type. The sequential pill is used following an abortion.

The micro-pill is taken continually. It should be recommended in case of heart condition, blood pressure or during lactation.

Before a pill is prescribed, an general examination (blood pressure, weight, pilosity) and a gynecological examination are required, along with a talk with the woman or the couple, to provide information on how to take the pill and on the need to take it punctually, followed by a second consultation if adverse reactions develop (absence of menstruation, bleeding, breast condition, weight gain, hypertension, etc.). A biological check-up (testing for blood sugar, cholesterol and triglycerides) should be done annually.

First, there are natural methods such as withdrawal, the rhythm method and the billings method, based on observation of the quality of the cervical glair by the woman herself, which fall into a separate category. These methods are quite effective when they are systematically practiced by a motivated woman.

There are also mechanical barrier methods.

The condom is particularly useful, since it affords protection against sexually transmitted diseases, and against Aids in particular. Strict regulation of the quality -permeability- of the condoms whose sale is authorized is capital.

Vaginal contraception using a spermicide is increasingly used, but it demands that the woman be both motivated and conscientious. Spermicides are valuable adjuncts in the prevention of sexually transmitted diseases ; their contraceptive efficacy is comparable to that of the intrauterine device.

Contraception with the intrauterine device (IUD), or coil, is a widely but variably used method : of the 60 million women users around the world, 80 % live in China, and 6 % in the developed countries. This method is totally respectful of ovulation and simply modifies the migration of the spermatozoons and the possibility of implantation in the uterus of a fertilized egg. The latest generation of IUDs contain some copper, which increases their effectiveness. The risk of extra-uterine pregnancy is multiplied by 5 in IUD-users. Delayed menstruation, pelvic pain or bleeding in an IUD-user should always be followed by a complete gynaecological investigation so as to eliminate the eventuality of an extra-uterine pregnancy, which may be fatal.

Insertion of a coil is a simple act at present, and may be learned by health workers in any peripheral centre. Surveillance involves screening for vaginal infections and their treatment, since the IUD may contribute to their extension to the uterus, fallopian tubes - salpingitis- and true pelvis.

Contraception by injectable, delayed-action progesterone was adopted by over 10 million women in 1980. It involves the administration of injectable progesterone once every 12 weeks. Medroxyprogesterone acetate, commercialized in two forms, is used : Medroxyprogesterone (Depo Provera and Prodasone) and Norethisterone Enanthate (Noristerat).

The contraindications are the same as for oestroprogesterones, to which should be added nulliparas, women with reproductive difficulties (since fertility resumes more slowly when injections are stopped), aftermaths of abortions (bleeding) and breast-feeding for Noristerat.

With delayed-action injectable progesterone, amenorrhoea is frequent. The method is often abandoned because of bleeding. Surveillance is the same as for oral contraceptives (weighing, blood pressure and biological check-ups at regular intervals).

Norplant is a recent method which is increasingly used in certain developing countries. It is a subcutaneous implant, inserted under local anaesthesia, containing a synthetic progestational hormone, Levonorgestrel, used in contraceptive pills, but in a form that is gradually eliminated over a 5-year period. This method is just as effective as the intrauterine device. If pregnancy is desired, removal of the capsule, under local anaesthesia, is a simple operation. The contraindications for norplant are the same as for oral contraceptives. Its drawbacks are bleeding or amenorrhoea.

This rapid survey indicates that no currently available contraceptive method is totally devoid of shortcomings. In fact, research on contraception is insufficiently funded, unfortunately, since birth control is truly a worldwide problem.

The presently available range of techniques and devices does actually generally provide an appropriate solution for every woman. This is the role of planned parenthood centres, which -it should be remembered- must be located in close proximity to the grassroot level, so as to ensure the broadest possible access. This requires that health workers be trained at all levels, and that the population's awareness of the problem be increased, with the eventual help of women's associations, for instance.

APPENDIX 1

INFECTION - ASEPSIS - HOSPITALISM

INFECTION

Prevention of puerperal infection, asepsis during delivery and the fight against hospitalism are priorities in the combat against maternal mortality. Reflection and action in these domains require an understanding of the mechanisms of infection. These will be summarized in this chapter.

Hygiene is the science of the measures required to maintain health. It is a long-known fact that living conditions influence people's health status. Housing conditions, work and diet, for instance, play a considerable role in health. Overcrowded homes foster the communication of diseases from one individual to another.

Human beings have huge numbers of bacteria on their skin, mucosa (tissues lining the body cavities : the mouth, vagina and hollow organs : intestines, uterus, bladder, etc). These are normal hosts in the intestine, and secrete substances capable of preventing the harmful multiplication of other species, thus playing a protective role. Outside of the body, bacteria are also active in many processes such as the purification of human excrements (in septic tanks) and the production of dairy products (cheese, butter, yoghurt), alcoholic beverages (beer, wine) and medications (antibiotics).

The skin and mucosa are the first barriers encountered by a germ. They are extremely effective, provided they themselves are not damaged. A minor skin wound, or a vaginal abrasion are entry points for a germ, just as rupture of the foetal membranes makes contamination of the amniotic fluid possible, whence placental and foetal infection.

In some cases, the bacteria proliferate within the body, which is incapable of defending itself sufficiently : this bacterial aggression and the body's response determine infectious disease. The virulence -that is, the proliferative ability of the bacteria- depends on the bacteria itself, but also on the host organism. For instance, small children and ailing individuals are more fragile. Malnutrition and anaemia, physical exertion, fatigue and surgery all predispose to severe infection. This is particularly important in hospitals. Cold plays a role in respiratory ailments. Corticosteroids, which are effective in treating some extremely severe acute infections simultaneously foster microbial complications. A wound may be a gate for tetanus, just as the catheters used in hospitals may introduce the germs causing septicaemia.

Neonates are often protected against infections by their mother, through the antibodies she has developed, and which are capable of crossing the placenta or are carried in the breast milk. During the first months of life, the infant is protected against those bacterial and viral infections for which his or her mother has been immunized. The role of breast milk is therefore irreplaceable.

Immunity is apparently diminished during pregnancy, and this makes the expectant mother more open to infection. This has not been proved, in fact, and no convincing explanation has been provided as yet. One fascinating immunological problem is the fact that the mother's body accepts the fertilized egg and the foetus, since this is the equivalent of accepting a transplant. Indeed, the foetus contains features inherited from both the mother and the father. The woman's organism therefore accepts a foreign body within it, without showing any sign of rejection. An immunological hypothesis is now visualized in a certain number of gestational conditions. Pregnancy toxæmia (hypertension, eclampsia) in particular may apparently be at least partially explained by an immunological process.

ASEPSIS

Sterility Asepsis

Since a basic rule in medicine is "do no harm", it is important not to introduce any micro-organisms (bacteria, viruses) into a patient. This means that work must be done under proper conditions, respecting asepsis and using sterile equipment.

Sterility is the total absence of germs (bacteria or viruses) in a given environment. Asepsis is the means of avoiding infection by a number of techniques aimed at preventing the introduction of germs into a sterile environment. The main techniques are :

- moist heat (120 to 130°C) using an autoclave ;
- dry heat ;
- ionizing radiation for pharmaceuticals, biological substances, surgical thread and plastics ;
- evaporation of formaldehyde ;
- an open flame.

To disinfect the skin and surroundings, chemical products known as antiseptics are utilized :

- for the skin : soap, alcohol, iodine derivatives, chlorhexidine, hydrogen peroxide, Dakin's fluid (chlorinated solution) ;
- for water and general disinfection (floors, walls, delivery table, etc) : chlorine (Javelle's solution).

Disinfection of sputum, pus or vomiting requires use of 5 % Javelle's solution during 4 hours, for stools, a 6-hour application of 4 % cresyl or of whitewash is required.

Sheets and personal linen is disinfected with 3 % formaldehyde for 12 hours, or with 3 % Javelle's solution for 12 hours (smallpox, viral hepatitis).

Thermometres are disinfected with 80 % alcohol and medicosurgical instruments are immersed in glutaraldehyde (cidex, a bactericide and a virucide).

Germs located on a wound may be destroyed using chemical substances, or antiseptics. Other (higher) concentrations of these same substances are used as disinfectants in sterilizing objects. Asepsis uses these methods to prevent contamination by germs during surgery or childbirth.

Table 9

INACTIVATION OF THE HEPATITIS B
AND HIV (AIDS) VIRUSES

Hepatitis B virus	HIV*
Heat to 60° C for 10 h	Heat to 56° C for 30 min
Heat to 98° C for 20 mn	
Javelle's solution = 2 h (1/10 dilution)	Javelle's solution = 30 min (1/10 dilution)
Glutaraldehyde = 2 h	Glutaraldehyde = 30 min to 1 h Alcohol 90° = 3 to 10 min

* Resistant at room temperature

There is also the problem of treating communicable diseases. For this, antibiotics are used. It is a fact that certain moulds slow down or stop the multiplication of germs. The mould of penicillin notatum, for instance, possesses an active antibiotic substance called penicillin (Fleming, 1944). Penicillin is active against a great many germs (staphylococci, streptococci, diphtheria and tetanus toxoids). A certain number of antibiotics are presently known, each of which has a specific field of action : each antibiotic is not active against every germ, but only against some of them. It is important to be familiar with these before prescribing a drug. Certain germ strains develop resistance to antibiotics, and thus become increasingly difficult to eliminate. This is particularly true in a hospital context. Use of antibiotics is complex, then.

HOSPITALISM

This designates infections caught in hospital by a patient who is admitted for another condition. They may be life-threatening, and some maternal deaths are explained by this. Although they are not necessarily the only cause of a given death, infections caught in hospital may further complicate an already delicate situation. A caesarean section performed under unsatisfactory asepsis on a patient who is already exhausted by prolonged labour may be fatal. However, it is difficult to determine the exact responsibility of hospitalism in post-caesarean mortality, for example.

The germs involved in hospitalism may enter the hospital either in patients, in the personnel or in visitors. Hospital germs are often quite virulent and may be resistant to antibiotics.

The hands of the medical staff are the main vectors of infection. Linen, supplies (needles, sounds, catheters), instruments, etc. all contribute to transmission. Transfusions of blood or blood derivatives may also constitute vectors (see table 10). This requires clinical testing of people who come to donate their blood, as well as the strict limitation of indications for blood transfusions.

Table 10

RISKS OF INFECTION AND PARASITE INFESTATION INCURRED
BY RECEIVERS OF BLOOD TRANSFUSIONS

Bacterial diseases	Parasitoses	Viral diseases
Syphilis Brucellosis Rickettsiosis Toxaemic shock	Malaria Toxoplasmosis Filariasis Trypanosomiasis Leishmaniasis Babesiosis	Hepatitis B Hepatitis non-A, non-B CMV(cytomegalovirus) HIV (Aids)

Contamination is facilitated by "entrance points" such as those produced by venous puncture, catheterism, intubation, spinal taps, urinary probes, surgical and traumatic wounds.

Prevention

It is extremely difficult to combat the introduction of germs : no method is totally effective, but some are nonetheless essential.

Introduction of germs

Health workers should change their clothes when entering the unit (shoes and over-garment, at the least). Regulations should be set up for visits to patients : carriers of disease or infection should be kept out, and a certain number of rules for hygiene should be respected in the rooms. This is difficult when families are in charge of providing bed linen and food for hospital patients. Some hospitals organize living space for the families of transferred patients.

Patients entering the delivery room should be carefully washed, and this is even more true for those entering the operating room.

Colonization by germs

The fight to control germ colonization also involves rules for general hygiene. Overcrowded wards or transferring of patients from one ward to another should be avoided, beds and mattresses should be thoroughly cleaned before they are assigned to a new patient, hospitalization and delivery rooms as well as surgical units (floor and walls) should be washed frequently using a common disinfectant (Javelle water). Dejections and dirt should be carefully eliminated, and dirty laundry rapidly taken away. These are inexpensive measures, but they require that both personnel and patients be well organized and disciplined.

Transmission of germs

Two methods are involved in the control of germ transmission : asepsis and antisepsis.

In order to maintain satisfactory asepsis, instruments must be properly sterilized, and new, discardable devices should be used whenever possible for injections, venous punctures, etc. Reutilizable or already reutilized instruments should be immersed in a decontaminating or disinfectant fluid immediately after use. This first cleansing and rinsing is then followed by actual decontamination : at least 15 minutes soaking in glutaraldehyde (cidex). The instruments are then rinsed with boiled (or, when possible, distilled) water, dried with a sterile cloth and placed in an appropriate container in which sterility may be maintained (using formaldehyde tablets).

Sources of contamination

Hands are washed and scrubbed with soap and water before and after any manipulation of instruments or any medical act. Sterile gloves should be worn systematically, even for operations such as lumbar puncture. When such gloves must be reutilized, they should be carefully washed with soap, dried and placed in contact with formaldehyde. Before use, they are then rinsed with alcohol to eliminate particles of formaldehyde, which aggress the mucosa. Gloves should be systematically discarded after use on several occasions. Regardless of their quality, gloves no longer retain their original impermeability after 35 minutes of use. During surgery, gloves should be changed immediately following any perforation or cut. The twofold objective of the wearing of gloves should be constantly kept in mind : they protect both the worker and the patient. Wearing of over-garments, caps and masks should also be encouraged.

Antisepsis is complementary to asepsis. The skin and mucosa must be disinfected with antiseptics (iodine, chlorhexidine) before any surgical operation or endo-uterine manipulation. Once opened, bottles of antiseptics may be contaminated if kept for too long, and they then turn into real culture media : any bottle of antiseptic that has been open for more than one month should be discarded.

Routine antibiotherapy following surgery and/or endo-uterine manipulation, especially in at-risk patients (see puerperal infection), will prevent the development of infection. However, each case must be analysed, since blind preventive antibiotherapy has one major drawback : it may induce bacterial resistance to antibiotics. Every decision to administer antibiotherapy may have long-term consequences for the community, since it may generate risks for the future.

Prevention of infections within health units not only involves an effort to control the introduction, colonization and transmission of germs, it also acts on the sources of contamination.

It is advisable to isolate contaminated patients, so as to avoid transmission to the rest of the unit (patients and personnel). This is difficult to achieve in overcrowded units. A limited number of workers must then be designated to care for such patients, and strict rules be dictated for them : wearing of over-garments, caps, masks, washing of hands.

Blood transfusions should be reserved for cases in which it is indispensable. Strict medical selection of donors is mandatory, and auto-transfusion should be encouraged whenever possible (in extra-uterine pregnancies, for instance).

A long-term goal is the equipping of laboratories for routine testing of vials of blood prior to transfusion : this improves safety, by eliminating sources of contamination, although present techniques are unable to completely ascertain the absence of germs (and of HIV in particular). The creation of a blood bank makes the use of blood derivatives possible, and improves safety.

*Surveillance of health
personnel*

An effort should also be made to control infections linked with venous entries, since at least 10 % of catheters are infected : this represents a considerable portion of hospital infections, and requires the application of some rules, such as :

- limit decisions to perform IV infusions to the strict minimum ;
- withdraw endo-venous devices as soon as they are no longer indispensable ;
- respect the rules of asepsis strictly, especially hand-washing ;
- use discardable instruments whenever possible ;
- disinfect the skin carefully and repeatedly ;
- make sure that the catheter is firmly attached by an occlusive dressing, to reduce handling ;
- check for and detect risks of local inflammation (by observation and palpation).

Aerial transmission of certain diseases from the personnel to patients may be observed, for active pulmonary tuberculosis, influenza, rubella and a great many communicable childhood diseases such as measles, chickenpox and mumps. Other infections are vehicled by the blood, and contamination -with hepatitis B, non-A, non-B hepatitis, Aids, plasmodium falciparum, rabies virus or syphilis- may occur during an injection, a cut or a spurt of contaminated blood.

Prevention involves the immunization of health workers against tuberculosis (with the BCG : this protection is incomplete, and must be accompanied by the isolation of tubercular patients), hepatitis B (3 injections, a booster at 1 year and every 5 years thereafter, but this vaccine is expensive), rubella (in seronegative, effectively contracepted women), mumps and measles.

Preventive measures should also be taken against diseases transmitted by blood :

- wear gloves if there is a risk of contact with blood, body fluids or mucosa, with soiled instruments, walls or floors, and if the person has any open wounds on the hands ;
- avoid handling needles and catheters : after use, they must be placed in an unperforatable container specially intended for this purpose ;
- apply a dressing to any wound ;
- wash the hands before and after each treatment, and immediately after any contact with blood or any biological fluid (water + soap + 0.1 % Javelle water or 70 % alcohol) ;
- decontaminate -using Javelle water- any surfaces onto which blood or any body fluid has spurted.

Special emphasis must be placed on hand-washing, which should be done :

- between 2 patients ;
- before any aseptic treatment (vaginal examination, examination of a neonate, etc) ;
- following any septic treatment ;
- following manipulation of contaminated material (urinary probe, catheter, dressing, etc) ;
- before and after eating, after blowing one's nose or going to the bathroom.

APPENDIX 2

AIDS (1)

Aids is an infection transmitted by the HIV virus : it is globally epidemic. It may be transmitted by blood, sperm and genital secretions. It is noteworthy that in Africa men and women are affected in approximately identical proportions. In Ruanda, 20 to 30 % of pregnant women are seropositive (and therefore infective). This retrovirus needs to enter a cell in order to proliferate. The main target cell is the T4 lymphocyte, which plays a cardinal role in the immune system, where it stimulates the macrophages and cytotoxic T8 lymphocytes. After this, there are two possibilities :

- the virus may remain dormant : there is no clinical symptom, but the infected lymphocyte may be transmitted and contaminate other organisms over a period of several years. The patient is said to be seropositive (the virus is present in the blood) ;

- the virus may become active : it proliferates, and with the help of the material in the cell it parasites, it produces a virion, which enters the blood and goes on to infect other lymphocytes. These infected lymphocytes are destroyed, resulting in the complete disorganization of the defense system. This is the disease Aids, the outcome of which is fatal. Research aimed at developing treatment and a vaccine is still under way (see Figure 21).

Pregnancy may aggravate Aids.

Transplacental foetal infection is possible after 12 weeks of gestation. Foetal contamination may also take place during delivery. Contamination occurs in 20 to 50 % of cases.

If pregnancy and delivery are normal, the cord must be disinfected with Dakin's solution. The neonate should be decontaminated with diluted Dakin's solution. The child is always born seronegative, since his or her blood contains the mother's HIV antibodies, which disappear at the end of 8 months, on the average. The reappearance of antibodies at that point is an indication that the child is infected.

There seems to be only a slight risk of transmission during breastfeeding, but it cannot be excluded (2 cases reported in Ruanda).



Figure 21 - The HIV cycle in the body

Drawn from: M. CARO and F. LESEC, *Biologie clinique de Jérome*, Ed. ANGELARD

(1) see *Children in the Tropics* n° 172, 1988.

Breast-feeding is not contraindicated, unless the conditions for bottle-feeding are satisfactory.

The lochia should be collected in closed, leak-proof bags. The mother should wash her hands before caring for her child.

The neonate should not be given any vaccinations based on live vaccines (especially the BCG). Immunization against hepatitis B is possible.

Asepsis in hospitals is capital for prevention, and it should be remembered that the virus may remain active for a long time at room temperature. Asepsis should be the rule for all patients, and not only for seropositive or Aids patients. Auto-transfusion should be preferred whenever possible, and indications for transfusion kept to a minimum. Routine screening by serological testing of all blood specimens is necessary but does not completely exclude contamination. It is preferable to establish systematic clinical screening of all donors. An educational campaign should be launched, encouraging the systematic use of condoms with an unknown or seropositive partner.

In those countries where it is legal, voluntary termination of pregnancy may be proposed for pregnant women in whom Aids is diagnosed. Special attention should be paid to asepsis during abortion.

Seropositive patients desiring a child should be informed of the risk of foetal contamination (life expectancy at age 3 years is practically nil). Foetal contamination cannot be diagnosed during gestation.

APPENDIX 3

DATING THE BEGINNING OF PREGNANCY

Learning to date the beginning of pregnancy is essential for the proper surveillance of its progression, for predicting its term (expected date of delivery) and identifying the different events that may occur in the course of it : threat of miscarriage, premature delivery, postmaturity, etc.

This requires knowing the date of the last menstrual period : the first day of the last menses defines the beginning of the amenorrhoeic period (absence of menstruation). Pregnancy then lasts 9 moons of amenorrhoea, or 41 weeks, or again, 9 months and 10 days. When a woman does not remember exactly when she last menstruated, the birth attendant is obliged to use other indicators, but the dating of the term is then more difficult and imprecise.

Another possible indicator is uterine volume : toward the twelfth week (2 1/2 months), the uterus is the size of a large orange and the fundus may be felt above the pubic symphysis. At 5 months it reaches the navel. Vaginal examination may be used to assess uterine volume during the first 3 months of pregnancy. Experience and asepsis are necessary.

Too large a uterus is suggestive of a twin pregnancy, a molar pregnancy, an intercurrent tumour (ovarian cyst, uterine desmoid tumour) or an erroneous evaluation of term.

Too small a uterus would indicate a pregnancy less advanced than suggested by the date of last menstruation (long, irregular cycles), an arrested pregnancy or non-gravidic amenorrhoea (an anovulatory cycle, for instance). Amenorrhoea is not necessarily synonymous with pregnancy. Last, obesity may interfere with the assessment of uterine volume.

Foetal movements are generally perceived by the mother at 4 months, sometimes slightly sooner in multiparas. The date of these first movements may help in dating the pregnancy.

Foetal heart sounds may be heard between 4 1/2 and 5 months, using Pinard's stethoscope.

X-rays remain valuable in obstetrics, when echography is not feasible. In addition to information such as the number of foetuses, their position and presentation, certain skeletal abnormalities and some signs of intrauterine death, it is used to date pregnancy by detecting foetal ossification points : the calcaneal point appears between the 26th and the 28th week, the astragalian point between the 28th and the 30th week, the inferior femoral point (Béclard) at 36 weeks and the superior tibial point (Todd) at 38 weeks. When both Todd's and Béclard's points are present, the age is at least 38 weeks.

Echography, based on the use of ultrasounds, may be used at any time during pregnancy, to estimate the age and weight of the foetus, its vitality and position. Furthermore, it locates the placenta and shows the amount of amniotic fluid, the foetal physique and dynamics (movements, cardial kinetics). It is one of the most important technological advances with applications in the field of obstetrics.

PHYSIOLOGY OF THE FEMALE SEXUAL CYCLE

APPENDIX 4

From puberty (when girls begin to menstruate) to menopause (when menstruation ceases in the older woman), women's life is rhythmized by the regular recurrence of menstrual periods, or menses. A cycle is defined by the interval between two menstruations. It usually lasts 28 days, beginning on the first day of menses and ending on the first day of the following menses.

The cycle affects the ovaries and endometrium.

The ovaries are glands located close to the uterus, at the end of the fallopian tubes. Their function is twofold : they produce the reproductive cells, or ova -an ovum is released each month by an ovary- and regulate the secretion of oestrogen and progesterone, the female sexual hormones. Variations in these hormones command the uterine cycle.

The endometrium lines the inside of the uterus, which is a hollow muscle. During each cycle, the endometrium undergoes modifications commanded by the hormones produced by the ovaries. Menstruation is the result of the destruction of the endometrium, which is accompanied by a flow of blood.

The cycle is divided into two phases separated by ovulation. The first phase is the pre-ovulatory or follicular phase, lasting from the first to the fourteenth day of the cycle. Within the ovary, a follicle containing an ovum matures, and this follicle secretes oestrogens. Simultaneously, the endometrium begins to thicken, and its blood vessels develop.

On the 14th day of the cycle, ovulation occurs : that is, the ovum is released by the follicle, which "explodes" on the surface of the ovary. This ovum descends into the fallopian tube. This is where fertilization may take place : the ovum may encounter a spermatozoon. The result of this meeting is a fertilized egg, which evolves into an embryo. At this point, pregnancy has begun.

The second phase is the post-ovulatory or luteal phase, lasting from the 14th to the 28th day of the cycle. At the ovarian level, the follicle is transformed into a yellow body, or corpus luteum (so-named because it is yellow when on the surface of the ovary), which secretes oestrogens and progesterone. These two hormones (1) will further increase the growth and vascularization of the endometrium, which then becomes a perfect "nest", ready to receive the fertilized egg if pregnancy occurs. This egg itself secretes a hormone, HCG. Its presence in the blood is now used for the early diagnosis of pregnancy, which will "maintain" the luteal body for 3 months. If fertilization does not take place, the secretions of the luteal body decrease on the 24th day. This is then followed by a flattening of the endometrium and the destruc-

(1) A substance produced by a gland and released into the bloodstream, which carries it to the target organs where functioning it modifies. A hormone is a messenger that transmits information from one organ to another.

tion and elimination of the endometrial tissue, along with some blood, on the 28th day : this is menstruation.

All of these events are controlled by the brain, and more particularly by a gland located in its centre, and called the pituitary gland. The latter secretes substances which are transported to the ovary through the blood, and which control it : the pituitary gland orders the ovary to secrete more or less of one hormone or another.

When the functioning of this cycle is understood, it is easy to determine the date on which pregnancy began. When a woman's cycles are regular (with menstruation every 28 days), pregnancy begins on the 14th day (2 weeks after the first day of the previous menses). When her cycles are irregular, it is generally the first

phase that is more or less extended, whereas the second phase still lasts 14 days. Pregnancy should then be dated approximately by calculating the average duration of cycles. For example, if the cycles usually last 35 days, ovulation occurs somewhere around the 20th day.

When the woman is lactating, menstruation does not occur because the hormone needed for the production of milk by the mammary gland, known as prolactin and produced by the pituitary gland as well, blocks ovulation. When there is no ovulation there is no cycle, and therefore no menstruation. Actually, ovulation is not completely blocked, and may in fact occur : this explains why some pregnancies begin during the lactation period. Breast-feeding is not a contraceptive method. (Figure 22).

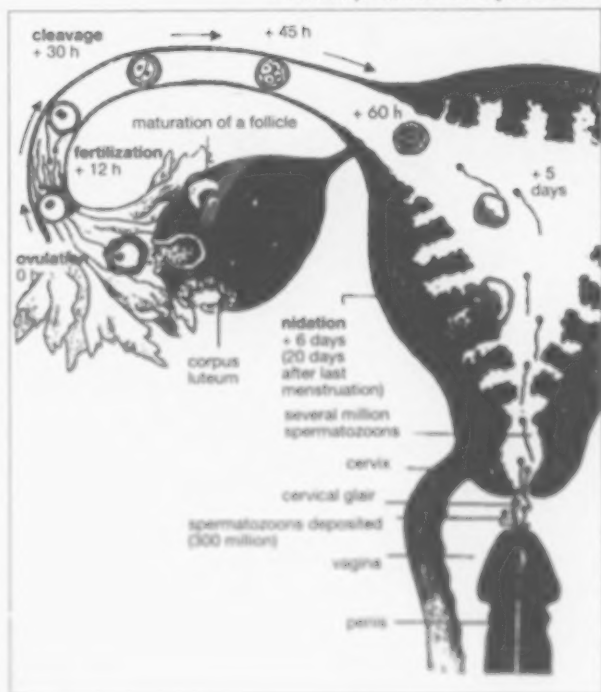


Figure 22 - From ovulation to nidation (general diagram)

Taken from : N. SALVIAT and B. DESBAUX, *Biologie classe de 4ème*, Ed. MAGNARD.

APPENDIX 5

PROTOCOLS FOR ANAESTHESIA - RESUSCITATION

Patient in shock

Patient in shock : she has imperceptible peripheral pulses (felt on the wrist or foot), blood pressure not exceeding 80, polypneic breathing, mucus, pallid conjunctiva, and the palms of her hands are white. Management is as follows :

- first, venous catheterism, in the subclavian or internal jugular when no vein is accessible on the arm ;
- volume replacement with large molecules of glucose or salt solution, monitored by measurement of CVP (central venous pressure) ;
- blood grouping ;
- the patient is placed in a sloping position (with her legs raised) and lying on her left side (lateral safety position) ;
- oxygen therapy when possible ;
- Atropine (a parasympatholytic and central anticholinergic agent) combats the vagal failure by its tachycardiac action (increasing the heart rate) : 0.25 or 0.50 mg in slow IV administration ;
- Adrenalin (a sympathomimetic) combats shock : IM 1/4 to 1 mg, IV in emergencies : 1/2 mg in 500 cc in deviation with large molecules.

This leaves time to make a diagnosis and to seek the underlying cause, which may be haemorrhagic or septic, to decide on treatment (surgery) and to take blood from members of the patient's family.

When surgery is indicated, the anaesthetic protocol must be determined :

- no local-regional anaesthesia : in case of vasoparalysis, hypotension is aggravated and results in failure of the heart pump ;
- general anaesthesia : a narcotic, Ketamine (Ketalar) = an analgesic (Palfum or Fentanyl) = a curariform (Norcuron) ;
- systematic tracheal intubation, since a pregnant woman's stomach is never empty (it evacuates food slowly), and for the prevention of Mendelson's syndrome (pulmonary inhalation of gastric fluid). A severely anaemiated woman under Celocurine R should not be intubated to avoid possible cardiac rhythm disorders or arrest ;
- artificial respiration, using a respirator or manually (back and forth movement and O₂ or AMBU).

The problem of transfusion

Every attempt should be made to apply the rule of no-group and no-rhesus transfusion, and the selection of donors (avoiding women and the aging) (see Appendix 1). When a blood test is impossible, a drop of the patient's blood and a drop of the donor's

blood are placed together : if no agglutination occurs, transfusion is possible.

When no blood bank is available, it is preferable to use fresh blood, which provides the indispensable coagulation factors.

If coagulation difficulties arise, bicarbonate and calcium gluconate should be injected, along with vitamin K1 and adrenoxyl (active within 48 hours), administered intramuscularly. Laboratory testing may indicate a possible disseminated intravascular coagulation (DIC) in the presence of considerably lowered prothrombin concentration (PC) and platelet level.

The immediate elimination of the cause of haemorrhaging is of course essential. When feasible, auto-transfusion should be preferred to transfusion with a donor, in case of ruptured extra-uterine pregnancy.

Eclampsia

A large, main stem vein is required, and CVP must be measured to assess volume replacement. It is a fact that a hypertense woman may nonetheless be hypovolaemic. Proper treatment therefore requires sufficient knowledge of the situation.

Local-regional anaesthesia is contraindicated for the same reasons as in shock (sudden, excessive vasoparalysis and failure of the heart pump in case of hypovolaemia).

When anaesthesia is required for caesarean section, it should therefore be general, and Nesdonal (or Thiopental or Penthotal) (1) should be preferred until the child is extracted, reinforced by Valium once extraction is over.

It may be necessary to prolong anaesthesia for several hours, depending on the severity of eclampsia. An infusion of Nesdonal is then used in association with magnesium sulfate. A diuretic (Lasix) may be administered once the volume is correct (as shown by CVP), but not before then.

Among the antihypertensive agents, Nepressol is presently preferred to Catapresan.

Septic shock

- oxygen therapy and artificial respiration when possible ;
- peripheral venous infusion of Dopamine, Dobutrex (or Adrenalin, when these are lacking) ;
- broad-spectrum antibiotherapy (combating aerobic and anaerobic germs) ;
- rapid elimination of the cause : hysterectomy, peritoneal lavage - drainage ;
- fresh blood and hypercaloric intake.

Caesarean section

Spinal anaesthesia may be used following elimination of any suspicion of infection or of haemorrhagic disorder. At the slightest doubt, general anaesthesia and routine tracheal intubation are required.

(1) Anticonvulsant barbiturates.

ANTENATAL CONSULTATION CARD

REPUBLIC OF BURUNDI

Ministry of Health

1. MEDICAL SECTOR : _____		2. CS : _____		3. No _____	
4. NAME : _____		6. Arrondissement : _____		9. District _____	
5. Husband : _____		7. Commune : _____			
		8. Hb : _____		10. Accouché N. _____	

FIRST VISIT :	Should see Doctor	Should give birth in maternity
11. Age : _____ years : _____ over 15 ☐		_____ under age 15 ☐
12. Height : _____ cm _____ over 150 cm ☐		_____ under 150 cm ☐
13. Physical malformation (pelvis) _____ no ☐		_____ yes ☐
14. Number of pregnancies : ☐ less than 7 ☐		_____ 7 and + ☐
primipara _____ no ☐		_____ yes ☐
15. Existence of a subumbilical surgical scar _____ no ☐	_____ yes	
16. Any prior stillbirths _____ no ☐	_____ yes	
17. Any prior abortions _____ no ☐	_____ yes	
18. Date of last delivery : ____ / ____ / ____		
19. At home ☐ in maternity ☐ normal ☐		_____ complications ☐
20. Date of last menstruation : ____ / ____ / ____		
21. Uterine height : _____ cm normal ☐	_____ abnormal	
22. Expected date of delivery : ____ / ____ / ____		
23. Date of visit : ____ / ____ / ____		
24. 1st tetanus vacc. : _____ done ☐		
25. Any bleeding _____ no ☐	_____ yes	
26. Loss of amniotic fluid _____ no ☐	_____ yes	
27. Pale conjunctiva _____ no ☐ yes ☐		
if yes, measure Hb _____ Hb over 60 % ☐	Hb under 60 %	
28. Oedema _____ no ☐	_____ yes ☐	
29. At 5 months or more : foetal movement _____ yes ☐	_____ no ☐	
30. Date of next appointment : ____ / ____ / ____		
31. Some aspects of the role of the overnights obstetrical gynaecological nurse		

SPONTANEOUS INTERMEDIATE VISITS

Date	Complaints	Measures taken
LAST-MONTH CHECK-UP :		
32. Date : / /	33. 2nd tetanus vacc...done ☐	Should see Doctor Delivery in maternity unit
34. Head presentation _____ yes ☐		no ☐
is there : 35. bleeding _____ no ☐	_____ yes ☐	
36. other discharge _____ no ☐	_____ yes ☐	
37. pale conjunctiva/no if yes, measure Hb over 60 % _____ yes ☐		Hb under 60 %
38. oedema _____ no ☐	_____ yes ☐	
39. foetal movement _____ yes ☐	_____ no ☐	
POST-NATAL EXAMINATION :		
40. Any bleeding or presence of pus _____ no ☐	_____ yes ☐	
41. Other discharge _____ no ☐	_____ yes ☐	
42. Delivery at home ☐ in maternity ☐ Date : / /		
43. Complications : no ☐ yes ☐ vacuum extraction ☐ forceps ☐ caesarean ☐ section tear ☐ haemorrhage ☐ infection ☐		
44. child : boy ☐ girl ☐ alive ☐ birth weight ☐ stillborn ☐		
PLANNED PARENTHOOD :		
45. Interval between _____ last 2 deliveries : ☐ less than 2 years ☐		
46. Number of deliveries : _____ less than 7 ☐ 7 or more ☐		
47. Complication at last delivery _____ no ☐ yes ☐ if yes : caesarean ☐ section embryonary ☐ rupture ☐		
48. Spacing desired by woman _____ no ☐ yes ☐		
49. Spacing advised _____ no ☐ yes ☐		
50. Spacing accepted _____ no ☐ yes ☐		

Please write to us...

The team in charge of editing *Children in The Tropics* and Dr Luc Destanne de Bernis, are interested in hearing your opinion of the contents of this issue on childbirth. The following questions have been structured to help you formulate your thoughts, and send us your reactions :

- Were you interested in this theme ?
- Did you find some aspects difficult to understand ? Which ones ? For what reasons ?
- Do the proposed guidelines and activities seem appropriate to your local situation, to women's needs during this phase of their existence and to the resources available in the sector in which you work ? If not, why ?
- Do you have any personal experiences you would like to share with our readers ? Would it be possible for you to communicate these to us, and more immediately, to outline them for us, so that we may contact you and plan for their eventual inclusion in a future issue of the journal ?

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... Let us hear from you.

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CHILDBEARING AND WOMEN'S HEALTH

1990 - N° 187/188

A contribution to international awareness of the fact that pregnancy, a physiologically normal period in women's life, is not devoid of risks, particularly under the difficult conditions - dietary, health, familial, housing, work and stress - often prevailing, but that the situation can be improved.

An understanding of the difficulties encountered by women of childbearing age in the many regions in which health officials are at work, an assessment of their magnitude and identification of their real causes.

Development of preventive, curative and educational programmes and health action aimed at women, and adjustment of these to women's actual needs : identification of risks, monitoring of pregnancies and improvement of birthing conditions.

Increasing the awareness of women, young people and families of the psychological, physiological and cultural aspects of sexuality, and of motherhood as an ethical value, so that everyone may gradually come to understand its workings, the difficulties, the chances and the risks, and may help to analyse and improve the situation.

Seeing to it that resignation and submissiveness need no longer be the fate of women and men of all ages with respect to the hazards of pregnancy, and helping them to understand these, so as to participate actively in change.

These are the goals set by the authors of these pages, in sharing their experience and knowledge.

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